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Journal of Electricity

Devoted to the Economic Production and Commercial Application of Electricity
IN THE ELEVEN WESTERN STATES

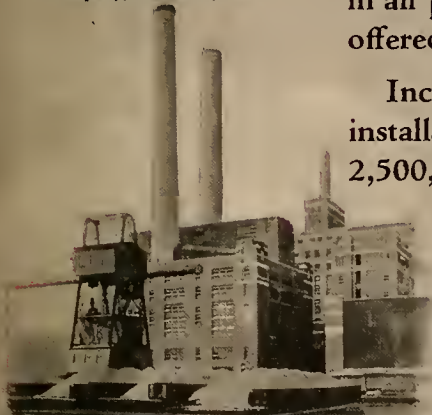
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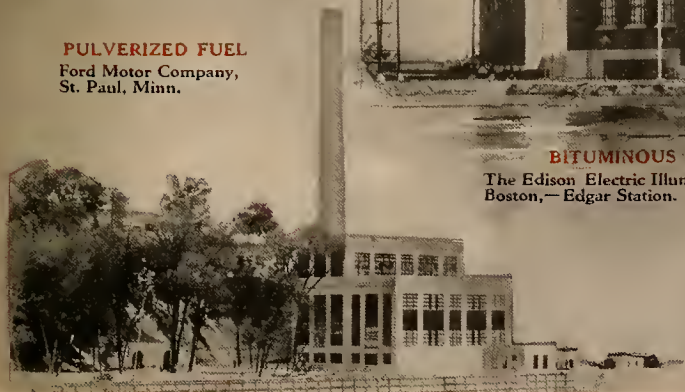
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Los Angeles, Cal.—Long Beach Station.



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Ford Motor Company,
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The Edison Electric Illuminating Co. of
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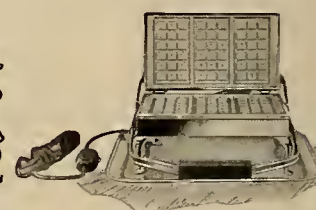
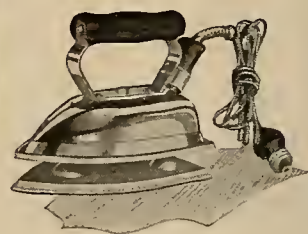
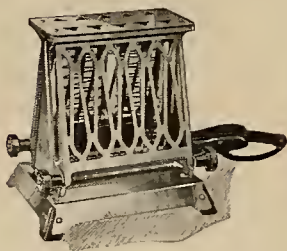
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With which is consolidated the "Electrical Journal" and the "Journal of Electricity, Power & Gas."

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Power

Hail, 1926!

HERE is 1926, another milestone along the highway of progress toward better things. Somehow, the load curve of evolution is not drawn upon a steadily rising scale but has its peaks and valleys, its starts and stops, and its ups and downs, even as Life itself. There will be a lull, a temporary hiatus during which it seems as though nothing were being done. Then will come a spurt, a sharp rise, when progress in a marked degree is almost of daily occurrence.

This year of 1926 will be one of the "spurt" type. There is no doubt about it whatever. It would seem that the electrical industry for five years or more has been resting on its oars, in reality gathering energy and, even more, a conviction that in the electrical idea carried to its ultimate lies the emancipation of mankind from the slavery of manual labor.

There is nothing perfunctory or trite in the expression of the customary Season's Greetings to our many friends whom it is our pleasure and privilege to serve. With all signs pointing to a coming season of unprecedented activity in every branch of the industry, with a sound financial and political structure throughout the nation as a whole, what more could one ask?

The duty that lies before us, therefore, is one of service, to render in full the best that is within us, to our customers, our fellow-workers and especially to the industry itself, that nothing may happen that will mar the splendid record of accomplishment that lies behind us.

Happy New Year, to everybody, individually and collectively, with the hope that the men of the industry in our eleven Western states may measure up to the great opportunity that lies before them.



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CHICAGO, First National Bank Bldg.
PITTSBURGH, Union Trust Bldg.

EDITORIAL

The Farmer

Sees the Light

DEPLORING what they call "the present tendency in America, and particularly in California, for cities to act as if they believed themselves independent of the back country," the farmers of California have entered the condemnation proceedings against the distribution systems of the Pacific Gas and Electric Company and the Great Western Power Company in the city of San Francisco. As reported on another page of this issue, the California Farm Bureau Federation, comprising 25,000 farmers of the state, has filed with the State Railroad Commission a lengthy brief in which it demands that any plan which proposes to separate the city distribution systems of existing power companies from the country distribution plants must protect adequately the farmers and small town consumers against damage or increased rates.

The filing of the protest is proof that in its educational efforts the light and power industry has not been remiss. The farmer, at least, realizes that a cheap and dependable supply of electric power is vital to the welfare and success of the rural districts. He also realizes, as the brief specifically points out, that electric service today requires co-ordination of widely separated generating plants; that the business requires feeding from a common pool widely varying demands from different classes of loads. He knows that under the present laws electric consumers in San Francisco with municipal distribution would escape taxes, with a resultant loss in state revenue which would have to be made up from other sources. And the farmer says:

"The action of the city of San Francisco in this case is a step backward; it represents retrogression, not progress—a splitting up of the system laid into its elementary parts.

"Electric service in California is rendered by systems, not by cities. All elements are interdependent—each helps the others. San Francisco is proposing to condemn local properties and businesses; is proposing to take from consumers a part of which now serves them. We have the right to demand that if such a proceeding is consummated, it must be upon a basis that will leave rural consumers forever as well off as they would otherwise have been."

Some journalist recently said that the advent of the automobile, electric lights, radio and the motion picture had changed the farmer from the "hayseed" of a decade ago to a smart, sophisticated, thrifty and successful citizen, as well versed in the affairs of the world as his city cousin. It has done more

than this. It has strengthened the inseparable bond between city and back country upon which the success of both depends.

The city of San Francisco will do well to think twice before it takes a step which will injure the rural sections of California, first, because the ire of the farmer today is a thing to be reckoned with, and second, because without the support and co-operation of the back country, the city cannot succeed.

Is This Member of the Electric

Family Suffering From Sleeping Sickness?

TO repeat an oft asked question, "What's wrong with the electric truck?" Every so often there is a blast of trumpets and a flare of red fire and the electric truck takes the center of the stage. Then suddenly the excitement dies down, only to be renewed again with headline announcements of power company policy, following which interest once more subsides and the reborn sinks into oblivion.

Notwithstanding careful study, the answer to the question is not fully apparent. Inquiry of power-company executives indicates a hearty support to the electric truck, yet to the uninitiated it would seem that the attitude is like that of the baker who advertised the splendid merits of his output, yet permitted his family to buy a competitor's product for home consumption.

An unbiased point of view inclines one to the belief that both the electric truck companies and the power companies are at fault; the former on account of earlier failures to meet intelligently the demands of the latter; the power companies in turn failing to realize the high efficiency of the modern electric truck.

Ignoring, however, the placing of the responsibility for the present situation on the Pacific Coast, where interest in the electric truck is certainly lax, investigation of the subject from other than an insular point of view develops many interesting facts. These at least indicate that there is either a lack of understanding on the Pacific Coast or an unwillingness even to seek out the facts. Here are some of them.

Electric trucks exclusively are used by the Commonwealth Edison Company of Chicago.

The electric truck fleet of the New York Edison Company has grown constantly year after year until it now has more than 300 units in the service of its affiliated companies.

The electric truck fleet of the American Railway Express Company is now close to the 2,000-mark and growing rapidly each year.

One bakery in San Francisco operates electric trucks exclusively, having more units traveling over the hills of the city than there are operating in the service of all power companies in California combined.

Obviously, the conclusion must be reached that the electric truck is a decided factor in city transportation. It would seem that the initial question might, in the face of these facts, be changed to "What is wrong with the power companies?"

According to the best information obtainable, the following appear to be the principal and most logical reasons why any individual power company should use and promote the sale of electric trucks:

1. In 1924 the average revenue from electric trucks amounted to \$153.10. Seventy-five per cent of city hauling can be handled economically by electric trucks. How much off-peak revenue is your company losing?

2. Why buy gasoline when you can do your own work better and at less cost with your own product—electric power?

3. Modern electrics speed up traffic and reduce congestion. Time saved is money saved.

4. Electric trucks balance load factor. No better outlet for off-peak power is provided than the electric truck. Seventy one-ton trucks in operation by a bakery use each year 1,302,000 kw-hr.

5. An electric truck is a splendid advertisement for electricity. To promote the sale of electrics and yet continue to use gas trucks where electrics could be used is equivalent to saying, "We believe in electric trucks for the other fellow."

It would seem that we have touched upon a member of our electric family which is suffering from sleeping sickness. Our columns are open for a frank discussion of his ailments, and we shall be glad to call in other diagnosticians and physicians to pronounce judgment or assist in curing the patient.

A Pretty Gesture, but Rather Expensive

WHEN a new building, a new theater, or a new public work is ready for the customary dedication exercises, there appear in the public prints in laudatory terms whole pages of advertisements dedicated to the congratulation of whoever is responsible for the new labor. These make very pretty pages, and no doubt the individual or company thus congratulated is moved to pride in the thought that public interest is sufficient to bring forth such a tribute.

But back of the lines there has been some enterprising newspaper advertising salesman, and he has used upon these individual advertisers a padded club to bring forth such pretty speeches so that his paper might garner additional revenue. Each new building offers these salesmen an extra pot of advertising revenue. So sure, so profitable have been their efforts in this direction that they have not been content with only one such special page for any given enterprise, now they go after a special

page when a new project is announced, and again for another bleeding of the constructors when the building is finished.

The power-company advertising men realizing this to be an evil, through their representatives in the Advertising Section of the Pacific Coast Electrical Association have gone on record for the abatement of this advertisement nuisance. But the electrical contractor, along with the architect, builder, concrete man, plasterer, painter, and what not, still is being milked by this polite form of blackmail.

This situation presents a problem for the Electra-gists to study and handle, even as the question of donations for charity, buying of tickets, and such other solicitations in a city usually are handled by chambers of commerce or merchants' associations. After all, these special editions are themselves nothing but solicitations for charity on the part of the newspaper. There is very little or any value received for the dollar invested in such advertising. The character of the advertising is such that it must be congratulatory, not of selling nature. In effect it is a bouquet of expensive flowers cast at the feet of the owner of the new building.

So serious a drain is this congratulatory flower-throwing to an electrical contractor that the flowers often must be bought at the sacrifice of something of real business-getting nature. One contractor claimed recently that he spent an average of \$275 a month in this form of laudation. In fact he felt that this demand upon his budget was so great that he could not afford to pay \$10 a month for a merchandising service which would help him to develop more sales in his store.

If they but realized it, those newspapers which resort to this form of exploitation are in a measure killing the goose which lays their golden eggs. Advertising in essence should be printed salesmanship. As such, developed to an effective degree, it should be used more and more by electrical interests as times goes on. Money spent on congratulatory advertising, bringing no results, is apt to throw any form of advertising into discredit, a reaction which eventually will hurt the very publications now resorting to this sort of bonanza-seeking.

Second Down, and Ten Months To Go

FOOTBALL has become so general a topic that it is easy to speak in terms of that great American game. It is only natural then that when signals are being called on an old issue an analogy to football may be applied to it.

For two successive downs the well known old brightly colored Water and Power Act has been thrown for a loss. And if in the weariness of the scrimmage many of the spectators have thought the game over, the sound of signals from the defeated team, heard in press reports already in those quarters where such visions never seem to die, has dispelled the hope. It looks as though the two teams would have to line up for another tussle.

Two colleges of thought face each other in this

game, a game of the people against the people. They are the School of Experience and Individual Initiative versus the School of Sublime Social Theories. The former wear the unromantic garb of gray facts and common sense. The latter are clothed in such colors as will catch the eye of all who are easily moved by emotion. What colors they are, too!

What tactics will be used in this next play is yet to be learned. Will it be a fake pass, the power football being hidden while a water feint is being made at one end? Will it be a drop kick, the football of power development to be tossed into the air for political winds to waft over the goal posts? Will it be an end run, seeking to escape the actual issue by some circumvention and break through for the touchdown so desired? One thing is sure. It will not be a straight line buck, hitting the facts squarely, for on such an attempt twice have the Theorists hit a stone wall.

It's a pretty fair game, and an interesting game, and all that, but isn't the cost of seeing it rather high, and are not the spectators becoming bored?

Consider the Architect How He Buildeth

IT isn't enough to sell the electrical idea to the home-owner. He is already beginning to get used to it. One now must go back farther. It is he who builds the house who must be taught to incorporate in it electrical convenience, available in that house wherever the home-owner eventually may desire it. In the program of bringing home to building contractors the electrical idea, that too is being accomplished gradually.

But there is one step further that is important. He who designs the dwelling in the first place, the architect, must be taught to design it with electrical convenience in view. The architect, the first link in the chain, is an important link; exceedingly so since it is upon his judgment and designing that the succeeding work must be carried out.

The expressed intention of the electric cooking and heating committee of the Pacific Coast Electrical Association's Commercial Section is an excellent one. It contemplates making contact with architects and consulting engineers with a view to the designing of homes with wiring adequate to accommodate electric ranges if they are desired by the future tenant, at no undue cost of installation or bother. Architects and consulting engineers are to be invited to become members of this committee to that end.

One enlightened architect and engineer in southern California is himself building an all-electric apartment building, upon the operation of which he hopes to make a study of the comparative economies of electrical versus other means of heating, cooking, and operation in general. Co-operation with this particular architect, it was announced by the committee chairman, is contemplated by the cooking and heating committee, to the end that the results of his study may be broadcast to other architects and builders.

It is always wise to begin at the source if one is to modify the course of any stream, be it aqueous or otherwise. And while, of course, the ultimate consumer, the home-owner in other words, is the primary source from which the need for new buildings originates, he usually turns over to his architect, engineer or builder the provision of those things which will add to his comfort or convenience. Therefore, it is most important that the architect, the designer, and therefore the actual source, be reached first in presenting the electrical idea. That he is to be invited to sit in with the cooking and heating men in the sessions of their committee work is an indication that his co-operation will be invited along still other lines in which his work and that of the electrical industry intermesh.

Would You Recommend a Home Without Faucets?

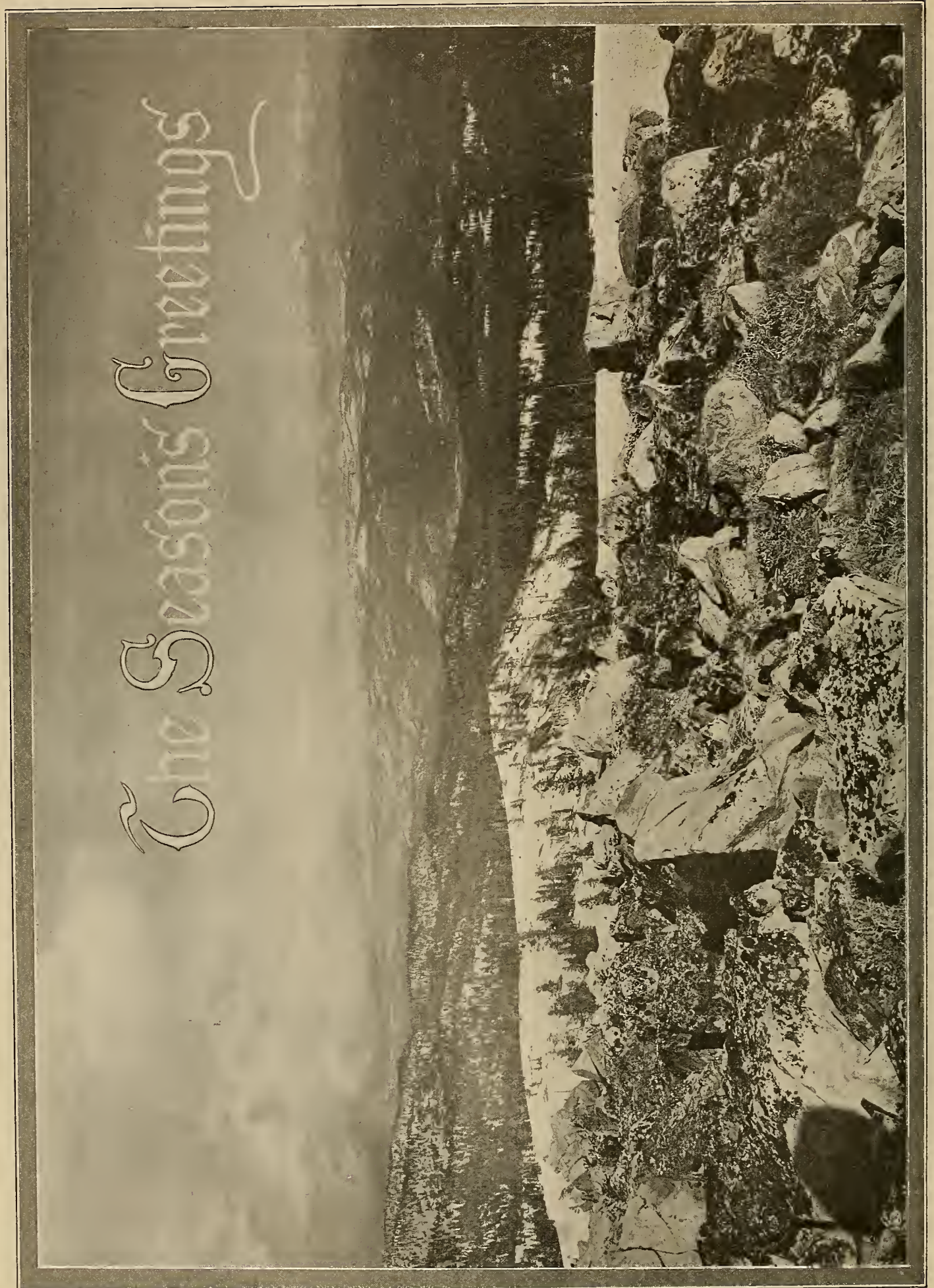
HAS the contractor a proper conception of the importance of his position in the scheme of utilization of electricity to the point where it will perform the greatest good for the greatest number of people? Too often, we are afraid, he sees his job as merely the placing of a few wires and the hanging of a few fixtures at a profit to himself—and sometimes at a very slim profit. His obligation to the industry and the public as the most important link in the chain of complete utilization and full enjoyment of the comfort and conveniences of electricity recently was set forth by A. K. Baylor, vice-president of the General Electric Company, in one of his public utterances. Mr. Baylor said:

"The contractor is entitled to the fullest support and encouragement so long as he appreciates that he is in his operations—particularly wiring—an agency of the power company.

"He takes, so to speak, the hosepipe from the reservoir of power to the point of its application and the obligation rests upon him to see that the work is safe and sound; that circuit capacities and outlets are ample and that unnecessary expense does not retard extensions of electrical service. Architects, builders and the public are coming to understand that suitable wiring is as necessary an element in the modern household as a heating system or water supply, but too often wiring is purchased on a price basis, and cost, rather than serviceability, is the deciding factor. The installation is then adjusted to the low price and the channels without which the product of the power company cannot be marketed, are restricted, clogged and throttled. On the other hand, costly elaboration may be overdone and, unfortunately, there is no national standard to balance this against safety and adequacy. The avoidance of either extreme is largely in the hands of the contractor—and in maintaining the balance he is the direct emissary of the power company."

In his dealings with the public the contractor must realize that not only the reputation of the power company but of the whole industry is at stake. For every job he takes he holds the golden key to electrical comfort and convenience.

The Season's Greetings



The Hydroelectric Power Situation in the West*

By John B. Miller

President, Southern California Edison Company, Los Angeles

IT is only a few decades since the railroads of the United States formed the great pool into which the capital of the country, as well as a large part of that of some of the European countries, found productive employment. More recently the public utilities and particularly the electric utilities of the United States, by the rapid extension of service to an ever-increasing population, to a large extent have taken the place of the railroads in the matter of financial requirements. The present enormous demand on the electric utilities for enlargement of facilities and extension of service shows that this tendency is still a long distance from having reached its maximum. It has become increasingly important to those responsible for the securing and expending of electric-utility capital that all possible safeguards should be thrown around electric-utility investments in order that not only will the investments themselves remain intact but that their reproductive character shall continue and that the highest extent and quality of service shall be furnished to the power-using public.

In studying the history of the railroads it is seen that in spite of their enormous service to the country they owe their present condition to unreasonable political control. In the past dissatisfaction was converted into political capital by those seeking public office under the guise of protecting the public and curing the railroads of their illnesses. Only the patient's exceptional vitality kept the cure from being fatal.

There is a tendency now to attempt to make a political issue out of the fact that electric utilities have become of great magnitude and are vital to American community life.

So many men were swept into public office on the wave of more or less manufactured hostility to the railroads and to some other large industrial cor-



JOHN B. MILLER

porations that many of those now seeking public office are attempting to use the electric industry for the same purpose.

Two methods have been employed to exercise political pressure on the electric utilities. The first, commission regulation, has been worked out to the benefit of both the utility and to the public, much to the surprise of many of those responsible for it. The second, however, is more serious. It is the continuing effort on the part of certain organized political bodies to take over the electric utilities and operate them on a political basis rather than on a business basis.

This phase of the situation must be squarely met and dealt with. It must be determined whether business enterprise or political

manipulation furnishes the best channels for providing the public with its necessary daily kilowatts, or if some part of the service can be furnished by public enterprise and another part by private enterprise, to determine how far each should go.

When the early electrical manufacturing companies had developed at great expense and risk to themselves systems of electrical generation and distribution suitable for the use of the general public, almost their first sales effort was to impress on municipal boards and councils the advantages of electric lights, first for street lighting and later for business and domestic illumination. Every town that could be induced to install electric lights was canvassed, and plants sprang up all over the country. These plants were of small size. For a time a dynamo that would supply 1,000 incandescent lamps was considered an enormous machine. These were outgrown rapidly due to the popularity of the new system of lighting.

Since the growth of business proved to be a serious matter to the municipalities, whose financial plan was necessarily limited of scope, and cumbersome, the tendency was to load up the plant to its limit of capacity and discourage further extension of business.

* Address before midyear meeting of Western Division, Chamber of Commerce of the United States, Seattle, Dec. 7, 1925

On the other hand, it was found that in those communities where the electric system was in the hands of business men rather than of town and city officials the growth of the business was much more rapid. Capital flowed more freely into the business enterprise and, with improvements in the art, the older plants were retired rapidly and newer plants of higher effectiveness and greater economy were built.

As improvements in the art continued, improved apparatus and equipment made it possible to transmit electricity to greater and greater distances, until it was found that several communities could be served more cheaply from a central installation than they could serve themselves from individual plants.

After the success of long-distance transmission had been demonstrated, it was found possible to use the power of remote and previously valueless water powers for supplying towns and groups of towns and that this procedure could be carried on only in the hands of business enterprise, since the activities of the municipalities were necessarily restricted to expenditures that could be made in or close to their own boundaries.

Many of the earlier municipal plants were sold to the growing business organizations in the interest of economy, flexibility of operation and of easier and more adequate methods of financing. Some of the others continued to operate their plants, supplying part of the business of their territory while the commercial plants supplied the remainder. Others (particularly those which had built up adequate distributing systems) found that they made sufficient savings by buying power from the commercial companies instead of operating and extending their own generating plants, and have continued so doing. The greater number of the so-called municipal plants west of the Rocky Mountains operate now in this way.

The City of Los Angeles finds itself in the position of a city owning a distribution system covering part only of the city's area and supplied partly from its own power plants and partly from purchases from a commercial company.

In the Northwest the cities of Seattle and Tacoma have the largest municipal electric systems serving only a part, and in San Francisco a municipal water-power plant is delivering its output through the agency of the local companies.

The fact that municipal ownership and political control obtains to some extent in the four large West Coast cities would indicate a wide adoption of the principle, until the relative sizes of these installations is noted. Out of the total installed horsepower of generating plants, both commercial and municipal, the proportions are as follows:

	Horsepower
Los Angeles, San Francisco, Seattle, Tacoma.....	396,000
Other municipalities in the West.....	39,000
Total municipalities.....	435,000
Total commercial.....	4,035,000
Grand Total.....	4,470,000

It is seen, therefore, that political enterprise is responsible for slightly less than 10 per cent of the

electrical developments of the West and that in the situation where it is most strongly entrenched its service is of a fragmentary and limited character. On closer analysis it can be shown that the whole tendency of the political-utility movement has been to take on as much of the cream of the business as possible to make a good showing and to avoid everywhere the skim milk.

The power problem, however, is not merely, or even primarily, the development of water power or the building of steam power or transmission lines or distribution systems. It is rather the building up of consuming loads which shall utilize, with economical efficiency, a steady co-ordinate development of all these things. The power plant does not create business. The power system makes the business possible, and the business makes the new plants and lines possible. Sketchy, fragmentary and local building of plants and lines to supply the local business of particular cities is uneconomic. Lean territories, as well as fat ones, must be given electric service if Western prosperity is to be broadened and general. Both the lean and the fat gain by this policy. The opposite policy means congestion in great population centers, and hardship in the rural districts, hardship for the farmer.

We look back over the entire history of government ownership in vain for any instance where any municipality or political subdivision, or any state, ever made one single major advance in the art of production, distribution and sale of electricity. Out of utilities in the corporate form and out of the manufacture of electrical machinery has come every important improvement. The original 110-volt direct current system; the "Edison three-wire system," the use of alternating current; the beginning of transmission at voltages that now look low; the successive steps from 10,000 volts to 30,000, 60,000, 110,000, 150,000, 220,000; the constantly increasing transmission distances; the improvement in the technique of distribution systems—each and every one came out of private initiative. Not one came from government, although city-owned electric systems started even with corporate utilities.

Every notable government-owned electric enterprise is a copy of what individual initiative, working under corporate form, has done somewhere else. Ruskin, I think it was, who said when he saw a dog walk on his hind legs, that the wonder was, not that the dog walked so well, but that he did it at all. The dog was only copying, rather badly, what men had done.

Are we then at the end of electrical progress? Shall we be satisfied only to have the old things done over and over as they are being done now, perhaps a little bigger, but the same old things? Not a man would agree to this.

Herbert Hoover, Secretary of Commerce, in his radio address of Sept. 29, 1924, said:

"America has made the most marvelous advance in the history of man in the technology and administration of transportation and applied electricity. Can anyone believe that this invention, this courage, this application, this stimulation to genius that our nation has

brought forth would ever have been developed under a board of directors of 530 members of Congress and hundreds of members of the state legislatures? Government utilities in other parts of the world got their technology from us. So far as I am aware, no single vital invention has ever come out of government-owned utilities."

So much for service. If you want service above all, you must not experiment with government ownership. Let us now consider the minor question of cost. Cost is wholly subordinate, yet government ownership shows no advantage even in the matter of cost; rather, when all factors are fairly included, cost is greater under government ownership.

Cost

The main claim of government-ownership advocates is that government can secure capital at a lower price than can corporate utilities; therefore, government can give lower prices for service. This claim is true only in a very narrow sense. In America the differential between cost of capital to a municipality and cost of capital to a sound corporation is today principally taxes. This is no saving at all. It is of no advantage to the citizen to pay part of the cost of the capital that serves him, by making up out of his own pocket the loss on the tax-free securities that government would issue.

Another claimed saving is that the lands, buildings and machinery bought with tax-exempt securities would be free of local taxes. This claim is equally without merit. Of course there is this double tax-exemption on government-owned enterprises. The bond dollar is tax-exempt as to income taxes. The dollar's worth of machinery bought with the bond dollar is tax-exempt as to property taxes. But even if there were ten tax exemptions, these would not constitute real "saving."

A third factor enters on the other side of the comparison. This factor is of great importance. Capital can be put into a public-utility enterprise only in case somebody, somewhere, has saved his capital by spending less than he received. Capital constantly is needed for all sorts of permanent improvement, both public and private. Each item of that capital must come out of the common pool, the total of individual savings over expenses for that particular year.

When government dips into a common pool, no matter what rate government may pay for the capital that it takes out, just that much less capital remains for others to get. Those others then—all the rest of the people—must pay higher rates.

No harm would come if government—taking capital out of the common pool—were to take it on the same terms as all others and were to take only for its real needs, but politicians never limit their borrowings to essentials; they never take capital except under the artificial advantage of tax exemptions. Thus, as governments enlarge their functions, our taxes climb and the cost of living goes up.

Effect on Democracy

I have said that service is the all-important thing, and so it is, if we consider business alone. When we come to consider the reaction on government itself, we find a factor of such importance that it puts both cost and service into the background. This cannot be too highly emphasized. I refer to the domination of government by its nominal creature; to the building up of a bureaucracy, and, thereafter, controlling the sources of public information; presenting its propaganda unopposed; marshalling its subordinates into a political machine; controlling elections and virtually (though sometimes surreptitiously) abolishing democracy. The process is exemplified by the political history of Ontario, Canada, under its Hydro-Electric Power Commission. The same circumstances are bringing a like result in our own city of Los Angeles. It is a real peril that threatens our democracy today.

My own company made applications in 1920 and 1921 for permits to develop Colorado River power, promising to spend at the rate of thirty millions a year. Government-ownership advocates took the field and so far have succeeded in delaying the permits. Except for this, the Colorado River now would be at work serving humanity. The politicians have prevented the people from getting that service. On the other hand, the politicians talk, talk, talk.

Mormon Hospital Is Electrified

AN interesting example of the efficiency of electric cooking in a hospital is afforded by the complete electric kitchen recently installed at the Latter Day Saints' Hospital in Salt Lake City by the Utah Power & Light Company. The new installation consists of a multiple-deck baking and roasting oven, two ranges, one two-deck 120-loaf oven (sectional type) and one toaster. With this new Edison equipment the Latter Day Saints' Hospital, which is one of the largest in the West, is said to be the peer of any similar institution in the United States, and is one of the five hospitals so equipped in the West.

The two-deck oven has a capacity of 1,500 loaves of bread every eight hours, or 72 pies at a baking. The roasting oven will roast 300 lb. of meat at one time. The two ranges, of the hotel type, each have four burners 8 x 20 in., and the toaster is capable of toasting 400 slices per hour.

In addition to the new equipment, electric machinery already on the premises included two ice-cream freezers, hot plates on all floors of the hospital, dishwasher, meat choppers, potato peeler, refrigerator, and other smaller appliances.

The institution now has a connected load of 67 kw., with a demand of approximately 43 kw. The equipment now installed provides a capacity of 1,800 to 2,000 meals per day. At the present time about 1,300 meals per day are being served.

The management of the hospital is extremely well pleased with the results obtained from the new equipment.

Hydroelectric Power in the Pacific Northwest*

By O. B. Coldwell

Vice-President and General Manager, Portland Electric Power Company, Portland

ONE of the great natural assets of the Northwest is its water power. Several reasons arising out of climatic and topographic conditions assist in making this region exceptional in this respect. One of these is that the descent from the Continental Divide to the Pacific is much more abrupt than is the descent to the Atlantic. Another factor is that the average rainfall is greater for the Pacific slope than for the regions lying to the east. The average rainfall in this vicinity is between 45 and 50 in., but in the mountainous regions where the streams rise the precipitation is much greater. With 8 per cent of the land surface of the United States, Washington, Oregon and Idaho have 30 per cent of the potential water power of the country. If we include the states of Montana and Utah, we have 16 per cent of the area and nearly 50 per cent of the potential water-power resources. If we take the eleven Pacific and Rocky Mountain states, we have 40 per cent of the area and over 65 per cent of the water power. The state of Washington has, according to the latest available statistics, a total of 4,970,000 potential horsepower of water power more than any other state of the Union, with a total of 560,693 hp., a little over 10 per cent, developed.

At this point it must be remarked that when the time for actual development is at hand a certain percentage of the water power listed will be found impracticable of development because of prohibitive costs. Just what this percentage will be is impossible to state.

This development of water power has taken place as part of a natural economic development of the territory. The electric utility company which has been in the forefront has kept pace with the growth of the industry and always has been ready to handle the increased growth in load. The financing of these developments has presented a weighty problem to the industry which, during the course of recent years, has been assisted greatly by the sale of the stock of the utility to its customers. This has come

WITH eight per cent of the land area, the states of Oregon, Washington and Idaho have approximately 30 per cent of the potential water power of the country. Some of the power sites are among the largest in the world. To date the utilities in this section have developed smaller water powers and have kept pace with the demands of industry. When conditions warrant, the public will find the utilities ready to supply their needs through the development of the greater power sites.

about through a gradual improvement in the relations between the public utilities and the public and by a more intelligent understanding of the problems of the utilities by the man in the street.

There are in the Northwest, in Washington and Oregon, on the major streams, especially the Columbia River, a number of very large power possibilities, such as those at Priest Rapids, Umatilla Rapids, and Celilo Falls. The possible power at each of these sites runs into the hundred thousands of horsepower.

Some day, when the industry of the commonwealth has developed to a point where this power may be absorbed, these will play an important part as additional sources of power. For the present, water powers of more moderate size, of which there are yet many, will be the ones to be developed. In practically all cases the water power to be had at a given site is a variable quantity, dependent upon the variation in stream flow as affected by the characteristics of the watershed. This makes it desirable and, in fact, necessary in many cases to develop artificial storage of waters if natural storage is not available. The creation of such storages involves heavy expense which adds to the average cost of power production but is a necessary adjunct in order to equalize the flow of the stream and insure a greater output during the low water season than would be possible normally. In many cases it is necessary further to supplement the water powers by means of stream relay plants which must be built and operated and the expense of which also adds to the average cost of power production.

The outstanding example of a power independent of shortages due to seasonal variations in stream flow is that at Niagara. Here the Great Lakes form a natural reservoir which maintains at all times a constant flow of water.

In localities such as the Northwest where there is a substantial amount of undeveloped water power there is constantly being spread harmful propaganda concerning the cost of water power. It is freely asserted that water power, God-given as it is,

* Excerpts from a paper before the midwinter meeting of the Western Division of the Chamber of Commerce of the United States, Seattle, Wash., Dec. 7, 1925.

is the cheapest form of energy and that the development of the larger units of water power yet available under public ownership is at once necessary in order to bring into the community industries on a large scale and thereby upbuild the state. It is the common practice of advocates of government ownership of water-power developments to present estimates of cost of producing power at the power plant as the price at which power may be obtained at the customer's premises. Nothing could be more misleading to the prospective customer than such estimates. The direct operating cost of a modern hydroelectric plant is trifling. The principal item of cost of energy obtained from the hydroelectric development is interest on the money invested in the development. There is a vast difference between the cost of a kilowatt-hour of electric energy on the busbars at the hydroelectric plant and the cost of that kilowatt-hour when it finally reaches the ultimate consumer's meter. For every dollar invested in the generation end of the business, at least another dollar and a half is invested in transmission and distribution lines, substations and utilization apparatus. The largest portion of labor employed by the electric utility is employed after the energy leaves the generating plant.

No one in the business of developing and utilizing water power has any thought of disparaging the merits of water-power development along economic lines, but the idea that the development of one or more of these major powers would result in power being made available so much cheaper than it is now to be had that it would bring in to these regions an influx of industry must be refuted.

In a survey of 275,000 industrial concerns operating in various parts of the United States, the United States Census Bureau has determined that, of the cost of the finished product of these plants, 2.8 per cent is assignable to the mechanical power and heat used. Other considerations, such as markets, the cost of raw materials, transportation, taxes, and labor, are the determining factors in the location of an industry. Throughout the West power rates are much below the average of power rates of the country and in all places are low enough so that any difference in the power rates of two different points is not of sufficient importance to have anything to do with the location of an industry:

Wherever a plentiful supply of cheap fuel from reliable sources is to be had, as is the case in many parts of the United States, even in some sections here in the Northwest, there will be a careful analysis of cost made before power is developed and when it is can be shown that the cost of electric energy is cheaper if developed by steam power, it is certain the steam method will be used.

In cities and towns electric service is almost universally available; not so in country sections. Of the 500,000 farms in the United States, about 8 per cent enjoy electric service. In some sections much has been done already in providing service lines for the farmer, but this is where a large number of small-sized farms are grouped together. It is the exception, however. Distances are great and the load to be had is meagre. This is one of the present

problems of the utilities and much thought and attention are being devoted to it. At the present time there is a co-operative study going forward in which participation is being had by the Farmers' Co-operative Association, Agricultural Colleges, the electrical manufacturers, and the public-utility companies. It is expected that new type of apparatus especially suited for conditions on the farm will be developed in the course of a few years that should assist greatly in the upbuilding of electric load on the farm, thus simplifying the problem of meeting the cost of the extension.

A subject about which there is much confusion in the mind of the public is that of so-called "super-power," to the application of which much merit is attached. It is merely interconnection of electric systems that for some years past has been gradually taking place and will be more in evidence as time goes on. These interconnections between large electric systems allow of surplus power being shifted and passed on from one system to another. Thus when a shortage of water is affecting a system in one locality, it is possible for it to receive aid from a system in another locality where the water conditions are such as to give excess power for the time being. In the southeastern sections of this country there have been very large interchanges of power during the past year through the medium of interconnection. Our systems here in the West now are connected up in such a way that it is possible to shift power from this region along existing transmission interconnections so that California at times may receive the benefits of some of the surplus of the Pacific Northwest.

In conclusion it may be said that the potential water power of the nation is being developed as rapidly as uses for the energy are found, and where water power is available it is being and will continue to be developed in preference to steam in all cases where the cost of energy so produced by water power is more economical.

California Electric Dredges for Russia

THE progress of electrification in Russia is indicated by the fact that the Yuba Manufacturing Company of San Francisco is building at its Marysville works five electrically operated mining dredges for service in the Ural Mountains in Russia. These dredges are to be used mining platinum and will be operated by the Platinum Trust of the Soviet Government.

Four of the dredges have a capacity of 13½ cu. ft. and one a capacity of 7½ cu. ft. The complete electrical equipment of motors, control and lighting service is being furnished by the General Electric Company, and the power for operating will be obtained from local transmission systems.

A commission from the Soviet Government visited the United States early in 1925 to inspect the operation of placer-mining dredges and, after a thorough investigation of designs and operating characteristics, selected designs of dredge equipment such as have been in operation in California for a number of years.

The Secret of Selling

An Interview with a Successful Woman Salesman, Who Tells How She Makes Friends and Customers at the Same Time

By Clotilde Grunsky

“THE secret of selling electrical goods,” said Mrs. V. M. Salmon, “is to give the customer not what she asks for but what she really wants.” This seemed to express a new idea, new, yet ringing true enough to demand some thought as to what it really might mean. Perhaps, too, she might be led to discuss more of the secrets of selling, for Mrs. Salmon, if anyone, could give an insight into them. She is a woman who has been eminently successful in the sale of electrical appliances, even though she has not been in the electrical business on her own capital, preferring to work for others so that she might be relieved of the burden of risk of the business, a burden which would act as an impediment to her sales efforts. But she has been store manager in more than one dealer’s establishment in San Francisco, and always she has lifted the store with which she has been connected to the foremost rank in that district.

“Always find out what the customer wants to use the appliance for,” went on Mrs. Salmon, “and then give her what will meet her needs. She is often asking for something which will not meet the requirement at all. One of the ways in which the electrical store loses out is to have an ignorant salesman sell equipment to a customer for which she may have asked but which later will not do the work. She does not blame her own judgment, but electricity, and then the store which sold her the appliance.”

“That implies considerable knowledge of electric appliances and what they will do on the part of the salesman,” she was told.

“Yes,” said Mrs. Salmon, “there is no use anyone’s taking up a business unless they really are interested in it and will make themselves masters of the material they work with. The successful electrical salesman should know not only what happens to be in the stock of the store he works for, how it is made, what it will do, but he should know what is on the market, so that he can either get the article for the customer or tell her why she does not want it. In any case, he must be in a

FOR the graces of life we look naturally to woman. For finesse in the elusive arts of salesmanship then and for an appreciation of those finer shades which leave in the customer of electrical goods a feeling that “this is a real place to do business with”, we may look to a woman. In this article a successful woman salesman of electrical appliances describes modestly those little touches which go into making sales an art rather than merely a business, with correspondingly favorable results to the store in its standing in the community.

position to give advice.”

“But some people do not like to be given advice,” it was suggested.

“They will accept your advice if they know what you are talking about. Rule one in any sale is to master your customer. If she is refractory and inclined to think that she knows more about a subject upon which she is obviously mistaken, it is worth while talking to her for a while to show her that you know what you are talking about. And provided, of course, that you really do know what you are talking about, she will recognize the worth of your suggestions and will

thank you for your interest and advice before she goes out.”

Take Your Own Medicine

“In this connection,” went on Mrs. Salmon, “it pays always to carry only the best material in your store, so that you can honestly defend the article you are selling against what may be the customer’s previous predilection. Use it in your home, too—and tell the customer about your experience with it in practice. And while you are about it, use the same article in your home that you sell in your store. It is not enough to use a washing machine or an electric iron—each should be of the make you are carrying and the one you recommend to your customer. You will know what you are talking about and your talk will have the ring of truth.”

“Do you believe in carrying more than one make of any given article?” she was asked.

“That depends,” said Mrs. Salmon. “In general, no. There are some appliances, like the electric iron, where there are distinctly different groups and it is well to carry one of each type. But the policy of any electric store is stronger if it will confine itself to one article in each line, selected because it seems the best. I don’t believe in selecting or selling stock merely because it is easy to get rid of—easy sellers often lose friends for the store in the long run. If you will take trouble to put up the necessary sales argument you can sell the less popular make which you have selected because it better meets the customer’s needs and as a result you will have a grateful and regular patron.”



Have your goods segregated. When you are talking waffle irons, it is very distracting to have your customer's eye fall upon a new type of toaster and have her begin asking questions about that.

"Never sit down," is one of Mrs. Salmon's maxims—"or at least, never be discovered seated when the customer enters the store. Never wait at the counter until the customer walks the length of the store to find you. Walk forward and meet the customer at the door, walking back to that department in which the customer is interested. It may be that she will see something on the way in which she is interested—and you will be there to answer questions.

"Have your goods segregated so far as the space of your store layout will permit. When you are talking waffle irons to a customer, it is very distracting to have her eye fall upon a new type of toaster near by and to have her begin to ask questions about that. If there are two shopping together, it is particularly difficult to keep attention focused on the matter in hand unless other articles of possible interest are eliminated.

"When another customer comes in while you are waiting on the first and asks a question, answer courteously but briefly, first excusing yourself to the woman upon whom you already are waiting. Should the newcomer ask for further information, tell her courteously that you will be with her in a minute but that you are busy with another customer.

"Never sell the customer an article she doesn't want. She may buy because she feels obligated on account of the trouble to which she has put you, but it is far better to lose the sale completely than to

let her go out with something which she is not convinced she needs."

Mrs. Salmon has an experience to illustrate every precept, and in this case tells how a customer who questioned her word as to an article nevertheless finally decided to take it. She got him to admit that he really didn't want it, whereupon she refused to sell it to him. He returned at a later date to tell her that he had found that she was correct—and placed an order five times the original one she had foregone.

"Is That All?"

"When the sale is completed," says Mrs. Salmon, "never say 'Is that all?' It implies that there is indeed nothing else wanted, and secondarily, it is discourteous, showing a lack of appreciation for what the customer already has purchased. 'Can't you do anything more than that?' is the implied paraphrase and it is not apt to create a pleasant feeling in the customer's mind. Thank the customer, ask her if she wishes anything more, and call her attention to something new which has just come in.

"In showing off new equipment which the customer has not asked to see, always remember that your time is worth something and let the customer feel that you are giving her something. If you make some such statement as, 'Would you like to see the new lamps that have just come in? I am free right now and have time to show them to you. I might be busy if you came in again,' you will find that the customer accepts with a sense of receiving rather than conferring a favor and will thank you for your courtesy and time at the conclusion.

"Walk with the customer to the door. It is an act of courtesy—and it gives a further opportunity to make a sale, should something further occur to the customer on the way.

"Let the customer know when you do things for her. If you have the article repolished before it is turned over to her, tell her about it. If you replace a screw free of charge in an appliance under repair, let her know that you have done it. She cannot appreciate your service unless she knows about it.

"Tell the purchaser how to take care of the equipment she buys. Vacuum-cleaner motors must be oiled as well as automobiles—and she will not consider the task formidable if she knows about it. In general if she will keep heating elements out of water and will keep her cords in repair, she will have no difficulty. It is well worth while telling her in advance that fumes from a gas stove will tarnish nickel-finished ware, so that if she has expensive appliances which are not in regular use she will keep them away from the gas stove, or wrap them in wax paper covered with newspaper if she cannot protect them otherwise. When tarnish has gone deep enough, it cannot be removed—and renickeling is a very expensive process, not calculated to encourage housewives in the way electrical.

"Give the customer freedom of the store. Someone always should be at hand in case questions are asked, but if the customer shows an inclination to look about without purchasing, do not force your



Give the customer the freedom of the store. If a customer shows a tendency to look about without purchasing, do not force your attentions. There are stores in which certain women will not trade because they are not allowed to look about for themselves, but are met immediately by a clerk who forces service upon them.

attentions. There are department stores in which certain women will not trade because they are not allowed to look about for themselves, but are met immediately by a clerk who forces service upon them.

"Bring the customer to the back of the store, if possible. If the article purchased is in the front of the store, show her something in the rear, if you can. So arrange the store that the articles most called for are well back within the selling space.

"Be more particular about the shopper who doesn't buy than one who does. The woman or man who makes a purchase has carried something away with her which, if you have sold wisely, will continue to make friendships for your store. But the woman who doesn't buy has only the memory of your words and the type of service she received. And yet she is as great a potential purchaser so far as the future is concerned as the other. Be sure to make her a friend."

"All this is about how to treat people after they are in your store," said the interviewer, "but how about getting them there in the first place?"

"The backbone of any business is the regular customer who comes in because she likes the type of your service and trusts your advice," said Mrs. Salmon. "Then, of course, there are the friends of your regular customers to whom the word has been passed along. But in bringing new people into your store, location plays the most important part."

"What is the best location for an electrical store?" the interviewer asked, not really expecting an answer. But Mrs. Salmon had one.

"In the apartment house district," said she. "Not only are there more inhabitants to the square inch in such a neighborhood, but there are more people who get their own breakfasts without proper kitchen equipment, and for whom the electrical table conveniences are almost essential. Moreover, the combination of an electric bill paid by the landlord, plus insufficient heat furnished by the janitor makes an excellent market for the small electric heater."

"Never locate an electric store next to a motion picture theater," she went on, shattering a popular fallacy. "Just watch the people who come out of the theater any evening. They are absorbed in what they have just seen and are either talking about the picture, or their heads are in the clouds until they come to the first curbstone which brings them to themselves because of the necessity of crossing the street."

"Good window displays, windows with color and with motion in them are business getters," said she. "And here's an idea I have wanted to try out; that is, to curve your window from the sidewalk into the front entrance. This means no angles to the glass or base, but an imperceptible curve which the passerby, interested in the window display unconsciously will tend to follow, until suddenly he finds himself at the door, which, if the climate permits, should be open, with an inviting interior to attract him further."

"Do you believe in sales?" was the next question.

"Not if the article which is reduced in price is alone considered," said Mrs. Salmon. "Sales are worth staging only if they are intended purely for the purpose of bringing people into the store in order to sell them something else. In that case the article offered should be a real bargain, and the aim of the store salesman should be to sell at least one other item to every purchaser. Such a sale of curling irons was made most successful by asking each customer if she had any provision for using the iron other than the ordinary light socket. Many double sockets were sold in this way, not to mention the developing of one or two prospects for wiring. With special effort, attention can be diverted to other equipment and often very satisfactory orders built up from customers who came in merely to follow up the advertisement of a sale."

"Nor," said Mrs. Salmon, "do I believe in charge accounts or selling articles on the installment plan with the idea that the payment of bills will bring the customer into the store. So it will, but she won't buy anything while she is there. She is trying as hard as she can to get rid of a troublesome bill for electric goods already hanging over her head and she is not in a good frame of mind to make more purchases. The installment plan is inevitable in selling large appliances to a certain type of housewife, but from the dealer's standpoint it should be avoided in so far as possible.

"Service is a fine thing, but avoid so-called 'grief' work. It does not pay to expend time and effort in

endeavoring to match glassware or in soldering some equipment which inevitably must fall apart again soon. Nine chances out of ten the effort will be a failure—and in that case the customer will have no appreciation of the impossibility of the task, but will remember only that you were responsible for its not being accomplished. The right thing to do is to direct the inquirer to the manufacturer where she can find out for herself that the line of glassware has been discontinued. She then remembers your courtesy—and you are saved a profitless expenditure of time."

"The carrying of radio parts comes also under that head, when indulged in by the average dealer," according to Mrs. Salmon. "Most of these are purchased by small boys who come in with ten cents held in one hand and with all the flair of making an important purchase. They want explanations and attention, which, if you carry the goods, you must in all courtesy give. This takes your time from other customers and brings no adequate return either in itself or in future business."

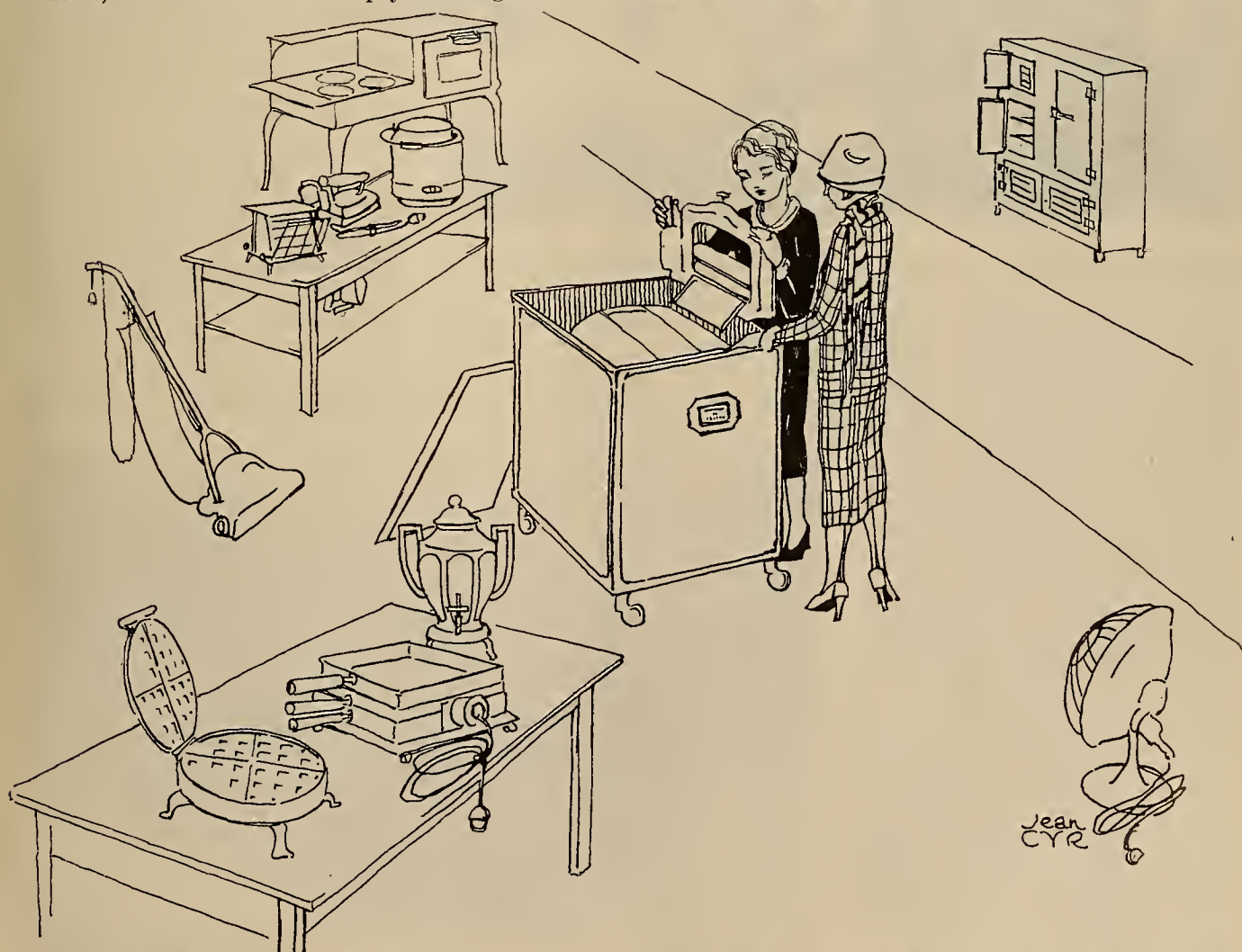
"After all," she suddenly summed up the entire conversation, "there are three major elements to making a success of any business—carry a good line of goods, use plenty of light in your store and windows, and hire the best help you can get.

"In regard to the line of goods you carry, by the way," said she, "I have found it advisable to carry a line which provides a service station for equipment somewhere at least in your section of the country. This means that repairs in equipment brought back can be made quickly, whereas otherwise it may mean three or more weeks for a very simple defect.

"As far as salesmen are concerned, it is a case of luck and good judgment and training. I believe in giving considerable personal attention to training new salesmen but not in oversystematizing the work. If there is too much red tape, no transaction ever is brought completely to a close, and there soon accumulates such debris of unfinished business that it is impossible to check up on mistakes until too late. It is far better to make each individual responsible for some one transaction from beginning to end, stimulating in him, if possible, a pride and an enthusiasm for his work.

"Personality and personal service are the basis for return trade—and return trade is the foundation stone of business success. My customers always say 'thank you' when they leave the store—and they usually come back again."

Which is quite true—and the reason she was asked for her advice.



—it is worth while talking to her for a while to show her that you know what you are talking about. And provided that you do know what you are talking about, she will recognize the worth of your suggestions and will thank you for your interest and advice before she goes out. . . . Tell the purchaser how to take care of the equipment she buys. She will not consider the task formidable if she knows about it.

CENTRAL STATION CONSTRUCTION OPERATION AND MAINTENANCE

External Heaters Used to Heat Powder Houses

Simple and Safe Devices for Maintaining Constant Temperature
Assist Handling of Immense Amount of Explosive

By G. C. HECKMAN, Superintendent of Electrical Construction, Southern California Edison Company, Big Creek, Calif.

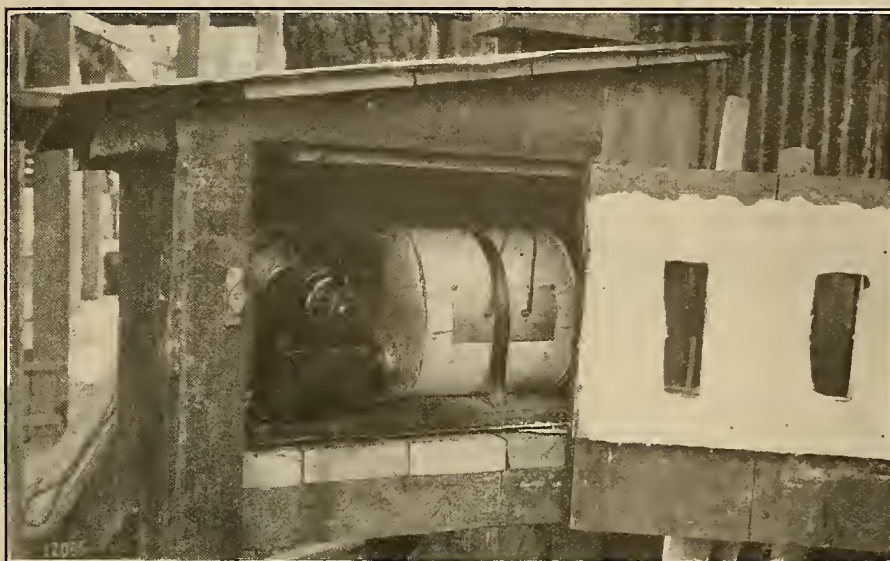


Fig. 1. Typical installation of automatically controlled heater for powder houses. Air is forced through the jacketed heater unit, through protecting screens and into the house through several feet of pipe

Explosives played a most important part in the tunnel construction on the Big Creek-Florence Lake project of the Southern California Edison Company. So great were the amounts used that the company was for many months the purchaser of the largest amounts of this material shipped to any individual concern excepting only the war department. Large quantities of powder and other explosives had to be stored at all camps, to be immediately at hand for the various tunnel headings.

Severe weather conditions made necessary some means of heating these powder storage houses and the handling houses as well. Of course fires of any kind were not to be considered and steam was not available. Therefore the choice fell to electric heat, not only from natural choice, but from necessity. However, it was considered unsafe to install any electric lamps, heaters or even wiring within the walls of any of these houses. Even with this safe form of energy there was the possibility of sparks. Light, therefore, was supplied from a reflectored lamp mounted on a pole several feet from a window and having its beam directed through the window.

Electric heaters were installed in small protecting structures adjacent to the powder houses as shown in Fig. 1. From these heaters warm air was

forced into the powder houses by means of a small blower and the necessary air piping. The motor, blower and heater were mounted together as a unit on a common base as shown in Fig. 2. This assisted materially not only in the as-

sembly of the equipment, but in the installation.

In the hot air pipe of each heater was installed an air strainer as shown in Figs. 2 and 3. This device was made up of several fine mesh screens or baffles arranged in a manner similar to that employed in the ordinary automobile muffler. This scheme prevented sparks and dust from passing into the powder house. Even without this spark arrester the possibility of sparks being blown into the houses through the hot air stream would have been remote. This device served as additional safety insurance and made the whole machine fool proof. The blower intake also is screened.

The temperature range under which explosives are most readily and satisfactorily handled is rather narrow. Therefore an automatic, thermostatically controlled device had to be rigged up that would have its operating mechanism inside of the house and its contacting mechanism outside of the house. The operation of both the heater element and the blower motor was to be controlled by this device. As finally designed this element was as shown in Fig. 4. As may be noted, the metallic operating coil of the thermostat is at one end of the long tube while the electrical contacts are at the other end of the tube. The visible shaft is a hollow tube through which is placed the solid rod which transmits the mechanical motion from the operating mechanism to the contacting mechanism by a turning motion.

In Fig. 5. is shown a close-up view of the operating mechanism. The screw immediately behind the operating coil is used to adjust the setting for the

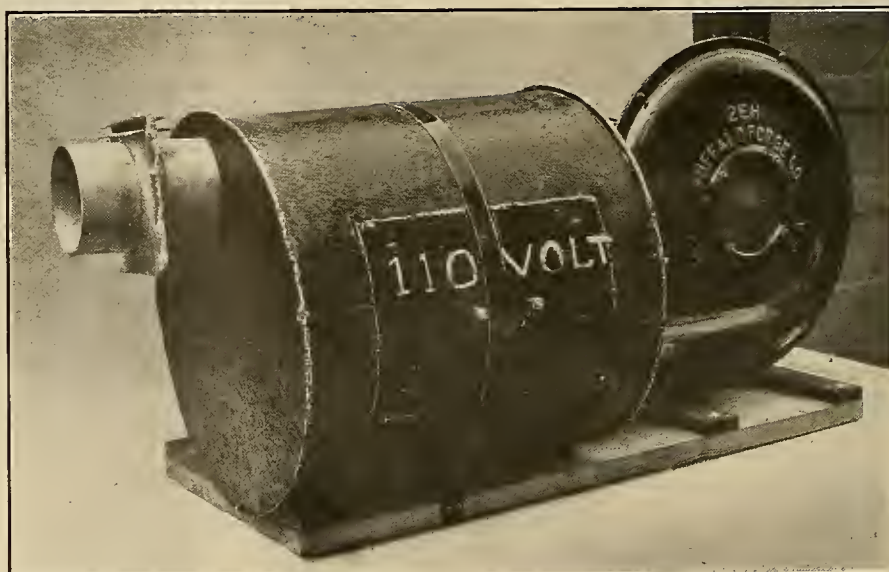


Fig. 2. Assembly of heater and blower on a common base. The heating units are mounted on the plate bearing the inscription "110 volt" and thus may be removed easily for cleaning or repair

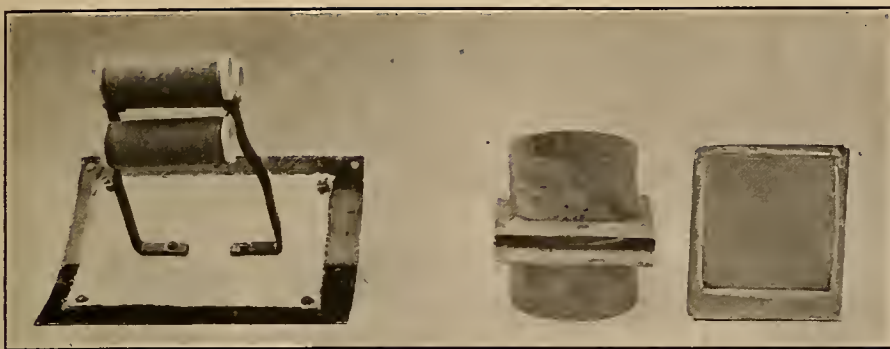


Fig. 3. An assembly of heater units (left) and the multi-screen air strainer (right). The screen arrangement in the air pipe permits easy cleaning of the screen.

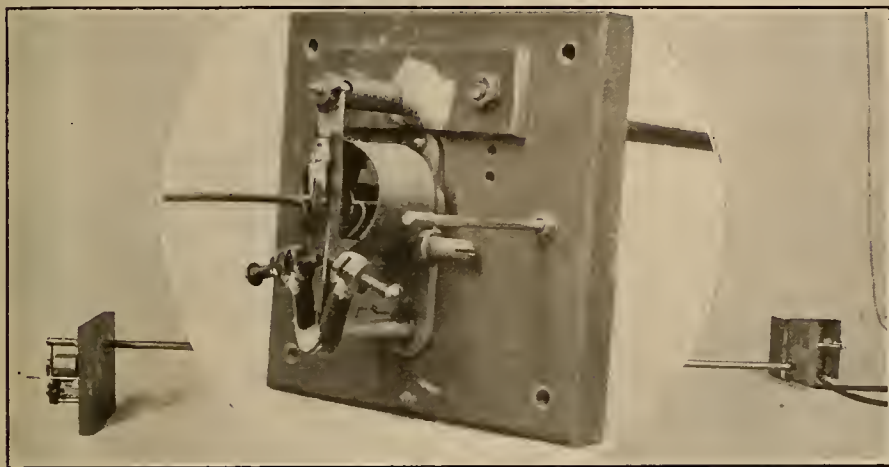


Fig. 4 and Fig. 5 (insert). Showing assembly details of the thermostat controlling mechanism. The actuator end (insert) is in the building and the contacts are outside.

temperature desired. Operation may be obtained within two or three degrees of the actual desired temperature. The two longer screws immediately in front of and below the operating coil are for finer adjustment. The distance between the points of these two screws corresponds to the distance between the contacts at the other end of the operating shaft. The amount which the soil can

move is controlled by these two screws.

The motor and blower is a standard unit and the heater coils are standard 500-watt units. The number of units may thus be varied according to the volumetric capacity of the building to be heated. The other features of the equipment were built in the electrical department at the Big Creek headquarters.

Brief Discussion of Transformer Handling Layouts

Obsolete Railroad Turntable with but Slight Modifications Facilitates Transformer Transfer at Pit Three

By CLINTON DE WITT, Assistant Engineer, Department of Civil Engineering, Pacific Gas and Electric Company, San Francisco

High-voltage outdoor transformers of the present-day large-capacity electric station must be arranged for rapid and convenient handling when emergency repairs are required. Delay in getting transformers back into service may cost large sums of money.

It is economical practice to use the main station cranes for this repair work as their capacity usually is ample. The layout then must permit rapid movement of the transformers from their permanent position to a point inside the station where the cranes may reach them. There are several possible designs which can be used in this connection.

Transformers usually are placed in a row parallel with the longitudinal axis of the station and the center line of the generating units. A transfer track runs parallel to this axis and is arranged so that a transfer car may be brought to any transformer position

and the transformer rolled from its place onto the car. This practice is common in most layouts.

The transfer track may run to a junction with the main railroad spur

entering the power house. However, this construction might require a great quantity of additional excavation if the station is located in steep country. As the loaded transfer car ordinarily cannot be moved by hand some means of power propulsion or at least handling by block and tackle will be required for the movement of the car. This usually entails pulling-piers for each stretch of track. Furthermore, the entire track must be absolutely level and therefore cannot be placed on soft ground without ballast. There are locations where this method may be the most desirable in spite of the drawbacks mentioned above.

Another design is to have a cross track entering the power house between crane columns. The cross track must be at the same elevation as the rails of the permanent transformer position and also the station floor. This means that the transfer track must be



Fig. 1—Showing Pit 3 turntable during construction period and indicating transportation condition to be met.

depressed the depth of the transfer car. As the transfer track usually must be crossed to reach the switch yard, this depression might be objectionable.

The transfer track may be extended just beyond the station building and a raised cross track built between the transfer track and the main station spur. If this design is used, two transfer cars are required or the transfer track must be extended to join the main station spur.

A layout, which does not require the extension of the transfer track to a junction with the main station spur and which at the same time permits the transfer track to be at the station floor level, is one equipped with a

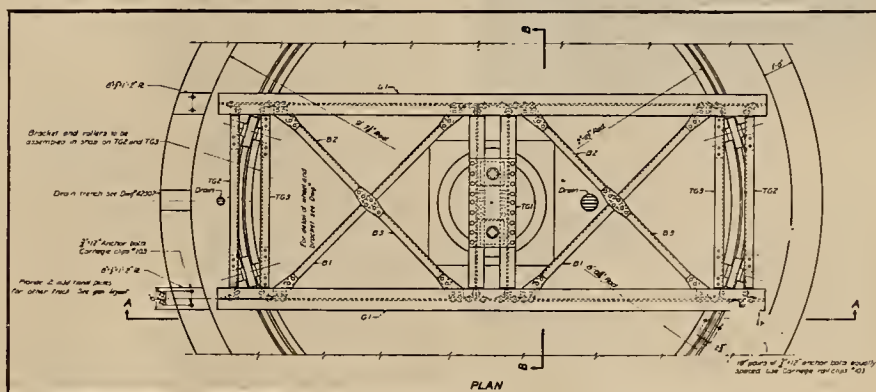


Fig. 2—Plan view of Pit 3 turntable showing structural features.

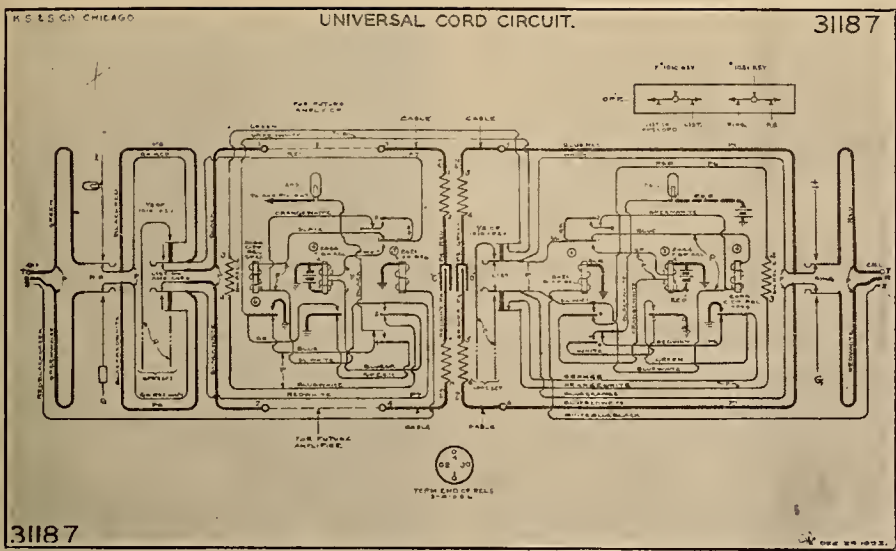


Fig. 18—Universal cord circuit used on the private-line board.

the line on which the call is being made, even though they may be busy when the code signal comes in. All cords on this board are universal cords (Fig. 18) so that any one may be used rigid in the plane transverse to the to connect local battery lines to other lines, either local or common battery, in any desired combination.

One unique feature of this board is the equipment used in each operator's circuit. Those who have used power company telephone lines very much undoubtedly have had the experience of receiving acoustic shocks due to having the receiver to their ear when some transmission line went down or some bad case of power trouble occurred. To provide against any such trouble to the telephone operators, the operator's circuit in each position is equipped with an "acoustic shock absorber" which effectively prevents any uncomfortable power impulses from reaching the operator's head set.

The calculagraph is used for recording all out-of-town calls. Tickets (Fig. 19) similar to regular toll tickets are

used, and they form a ready indication of the amount of traffic handled each day, week or month. Tickets are numbered consecutively for each day. These are filed away and can be referred to for any study of a line that may become overloaded with business. When a line becomes so congested that it seems busy most of the time a count of all calls and their duration is made for several days. From information so obtained a remedy generally can be determined upon. In connection with the operation of a switchboard of this class it is well to count all calls of different classes at least twice a year for a period of one week in order that some idea may be had as to the work being performed not only by the equipment but also by the operators.

On the installation pictured here with four women operators are employed on the private and Bell System boards between the hours of 7 a.m. and 7 p.m. Two boys operate from 7 p.m. to 12 midnight. Between 12 and 7 a.m. so few calls are received that all Bell System calls are handled by night connections to one of the substations and the dispatcher takes all private line calls. This provides for the operation of an adequate communication system for a power company, provided the system is maintained properly.

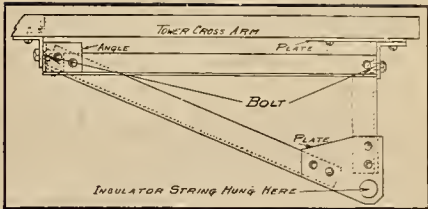
Editor's Note: This is the concluding half of the second of a series of three articles by Mr. Kalb. The third will deal with maintenance problems and will appear in an early issue.

Crossarm Brackets Effect 30 Per Cent Insulator Saving

By W. C. FOSTER, Assistant Operating Engineer, Portland Electric Power Company, Portland, Ore.

An interesting detail in connection with the Oak Grove transmission line of the Portland Electric Power Company is the use of special angle brackets on corner towers. Usually corners require special dead-end construction in order to provide the necessary clearance between conductors and towers. The use of the brackets as shown in the accompanying illustration obviates the necessity of any other special construction.

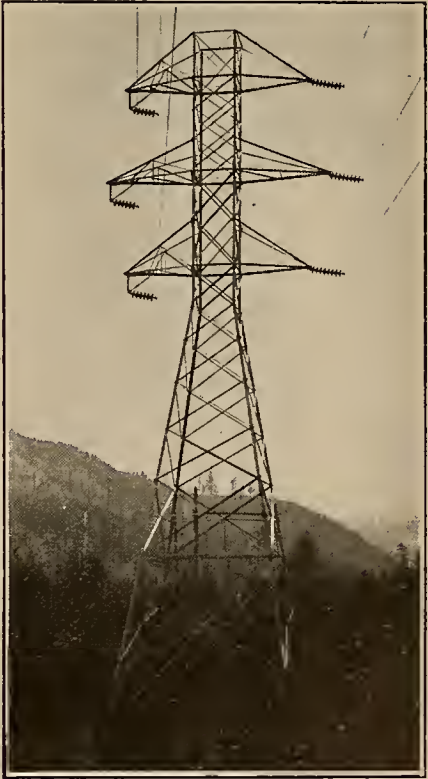
These brackets are pivoted to the



Enlarged detail sketch of angle bracket showing simplicity of structural features and method of attaching to tower arm so as to obtain rigidity across the line and flexibility lengthways of the line.

tower crossarm in such a way that they are free to swing in the line lengthwise of the conductors, but are rigid in the plane transverse to the line. This semi-flexible arrangement relieves the bracket of any strain that otherwise might be incurred in the case of unequal span loadings or with wires broken and at the same time preserves rigidity in the plane of the tower itself. To accommodate the additional stresses in certain crossarm members caused by the brackets, additional bracing is provided within the crossarm. The accompanying sketch shows some of the structural features of the bracket.

The reduction in the number of insulators and dead-end positions necessary in the rough country through which this line passes is a prominent item of economy. The character of adjacent country made necessary the construction of this line along the



Angle tower in the Oak Grove transmission line of the Portland Electric Power Company showing the effectiveness of the crossarm bracket in obviating dead-end construction.

Clackamas River canyon and angle river crossings abound as a result. In the case of this line the saving in the cost of insulators and hardware is estimated at fully 30 per cent. Further, as dead-ends are found to be the source of a greater percentage of trouble than are suspension strings, insulator trouble also is reduced to a minimum.

San Joaquin Light & Power Corp'n. Private Line

TELEPHONE CALL RECORD

No.

Date

Operator

From

At

To

At

Delay:

Hr.....Min.....Sec.....

Elapsed Time:

Min.....Sec.....

Fig. 19—Toll-call ticket form used for all out-of-town calls on company lines to keep track of traffic densities.

IDEAS FOR THE CONTRACTOR

Electrical Estimating for the Contractor — VI (b)

Continuing the Discussion of the Electrical Layout for a Furniture Manufacturing Company

By J. R. WILSON*, Engineering Department, Los Angeles Electric Works

All modern woodworking plants usually have some machines on which it is necessary to increase the frequency above that provided by the power company serving the plant. This is necessary in order to increase the speed on the cutting heads of moulders and similar machines. In this plant a Vonnegut moulder has the heads designed for high-speed operation, with controllers to regulate the speed steps from low to high.

There are several ways of doing this and most of the electrical manufacturers build regular frequency changer sets to meet the need. In this plant the scheme developed by Fairbanks Morse & Company has proved very satisfactory and is the second interesting detail of this factory. The layout is simple, having no multiplicity of relays and regulators to contend with, and has proved its reliability in over a year of hard usage.

The set consists of one motor driven by another through a belted connection, and the data on this set are as follows:

Driving motor: 20 hp., 440 volt, 1,440 r.p.m. induction.

Driven motor: 35 hp., 1,152 r.p.m., 440 volt on stator, 240 volt from rotor. Stator amp., 42; rotor amp., 65.

The driving pulley is 8 in. in diameter, while the driven pulley is 10 in. in diameter. The induction motor drives the slip-ring motor in the opposite direction to that in which the

slip-ring motor normally would rotate. By impressing the normal operating voltage on the stator 80-cycle current at 240 volts is taken from the slip-rings and delivered to the 240-volt motors on the moulder.

The only hazard in this set-up lies in the method of handling the control switches, as it is imperative that the induction motor be started and brought up to speed before the current

is delivered to the stator of the slip-ring motor. Otherwise the slip-ring would reverse itself under certain conditions and owing to its larger size would tend to drive the induction motor. The wiring diagram in Fig. 5 will serve to make this set-up clearer.

The business of this firm has grown enormously since the plant was put in operation. While the plant has not reached its maximum production capacity new machines are being installed very rapidly. The soundness of the fundamental basis on which the plant layout was made is being proved by the ease with which the increased demands are being met. Space for expansion is provided on each of the sub-

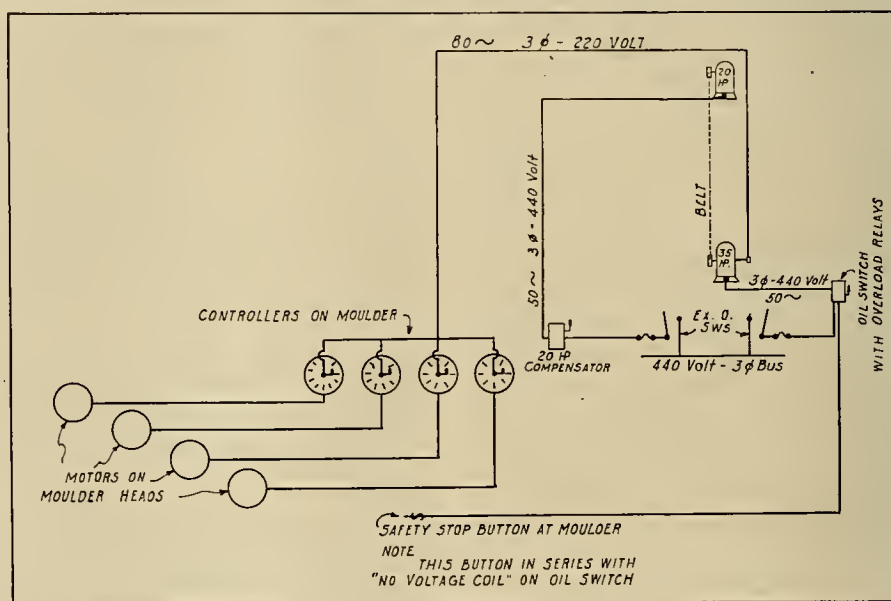


Fig. 5.—Schematic diagram of the wiring from the frequency changer to the moulder.

WIRING LAYOUT DATA—WHITE-SMITH MANUFACTURING COMPANY

Machine	Switch Size	Fuse Size	Conduit Size	Wire Size	Control	Motor H.P.	Machine	Switch Size	Fuse Size	Conduit Size	Wire Size	Control	Motor H.P.
Sub Panel 1 Blower.....	200A	200A	1 1/2	0	Compensator	75	Sub Panel 3 Top Sander.....	30A	25A	1 1/2	12	CR 7005	5
Sub Panel 1 Frequency Changer	100A	100A	1 1/2	2	Oil Switch	35	Sub Panel 3 Belt Sander No. 1..	30A	20A	1 1/2	14	CR 7005	3
Sub Panel 1 Frequency Changer	100A	65A	1	6	Compensator	20	Sub Panel 3 Belt Sander No. 2..	30A	15A	1 1/2	14	CR 7005	2
Sub Panel 1 Rip Saw No. 1.....	60A	50A	3/4	8	Compensator	15	Sub Panel 3 Dove Tailer.....	30A	25A	1 1/2	12	CR 7005	5
Sub Panel 1 Rip Saw No. 2.....	60A	50A	3/4	8	Compensator	15	Sub Panel 3 Side Rail Router...	30A	25A	1 1/2	12	CR 7005	5
Sub Panel 1 Carver.....	30A	20A	1/2	14	CR 7005	3	Sub Panel 3 Boring Machine....	30A	20A	1 1/2	14	CR 7005	3
Sub Panel 1 Knife Grinder.....	30A	25A	1/2	12	CR 7005	3	Sub Panel 3 Band Saw.....	30A	25A	1 1/2	12	CR 7005	5
Sub Panel 1 Pedestal Grinder...	30A	10A	1/2	14	Exo. Sw.	1	Sub Panel 3 Mitre Saw.....	30A	25A	1 1/2	12	CR 7005	5
Sub Panel 1 Jointer.....	30A	25A	1/2	12	CR 7005	5	Sub Feed 4 Stock Saw.....	30A	25A	1 1/2	12	CR 7005	5
Sub Panel 1 Belt Sander.....	30A	25A	1/2	12	CR 7005	5	Sub Feed 4 Spray No. 1.....	30A	10A	1 1/2	14	Exo. Sw.	1
Sub Panel 1 Swing Saw.....	30A	25A	1/2	12	CR 7005	5	Sub Feed 4 Spray No. 2.....	30A	10A	1 1/2	14	Exo. Sw.	1
Sub Panel 2 Mortiser.....	30A	15A	1/2	14	CR 7005	2	Sub Feed 4 Spray No. 3.....	30A	10A	1 1/2	14	Exo. Sw.	1
Sub Panel 2 Post Router No. 1..	30A	25A	1/2	12	CR 7005	5	Sub Feed 4 Spray No. 4.....	30A	10A	1 1/2	14	Exo. Sw.	1
Sub Panel 2 Post Router No. 2..	30A	25A	1/2	12	CR 7005	5	Sub Panel 5 3-Drum Sander....	100A	90A	1	6	Compensator	30
Sub Panel 2 Post Router Feed...	30A	25A	1/2	12	CR 7005	5	Sub Panel 5 Moulder Feed.....	30A	30A	3/4	10	CR 7005	6/3
Sub Panel 2 Shaper No. 1.....	30A	20A	1/2	14	CR 7005	3	Sub Panel 5 Glue Spreader.....	30A	10A	1 1/2	14	CR 7005	1
Sub Panel 2 Shaper No. 2.....	30A	20A	1/2	14	CR 7005	3	Sub Panel 5 Glue Jointer.....	30A	30A	3/4	12	Compensator	7 1/2
Sub Panel 2 Shaper No. 3.....	60A	35A	3/4	10	Compensator	10	Sub Panel 5 Planer No. 1.....	60A	50A	3/4	8	Compensator	15
Sub Panel 2 Rip Saw.....	30A	25A	1/2	12	CR 7005	5	Sub Panel 5 Planer No. 2.....	60A	35A	3/4	10	Compensator	10
Sub Panel 2 Single Drum Sander	30A	20A	1/2	14	CR 7005	3	Sub Panel 5 Trim Saw.....	60A	50A	3/4	8	Compensator	15
Sub Panel 2 Tenant Mach.....	30A	25A	1/2	12	CR 7005	5	Sub Panel 5 Double End Tenoner	60A	50A	3/4	8	Compensator	15
Sub Panel 3 Lathe.....	60A	50A	3/4	8	Compensator	15	Boiler Room Compressor.....	100A	65A	1	6	Compensator	20
Sub Panel 3 Disc Sander.....	30A	25A	1/2	12	CR 7005	5	Boiler Room Vacuum Pump....	30A	25A	1 1/2	12	CR 7005	5
Sub Panel 3 Jig Sander.....	30A	25A	1/2	12	CR 7005	5	Boiler Room Oil Burner Set.....	30A	10A	1 1/2	14	CR 7005	1
Sub Panel 3 Special Sander.....	30A	25A	1/2	12	CR 7005	5							

Note: Wire sizes conform to State Code.
Conduit sizes conform to Los Angeles Code.



Fig. 6.—Partial view of sub-panel 1 showing compensator for blower and compensator and oil switch (upper left) for frequency changer outfit.

power panels and has more than justified the added investment in increased copper sizes. The fact that the increasing motor load is being added to these panels without any money being

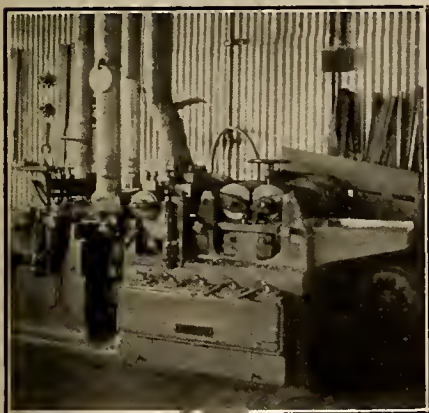


Fig. 7.—Vonnegut moulder showing controllers at the front of the machine.

spent for changes to the original layout speaks well for the thought given to the job at that time.

It Worked Both Ways

H. H. Stover, of the Domestic Electric Appliance Company, Colorado Springs, was showing an electric iron to a fastidious old lady.

"How much?" she asked.

"Seven-fifty, complete," replied Stover, handling the iron as a polite salesman does.

"What would it be without the cord?"

"Well, the cord is supposed to go with the iron, so I'd have to ask you \$7.45 anyway."

"What? Only a nickel for the cord?"

"Yes. Just a nickel."

"Good. It was only the cord I wanted!" she said, as she deposited a five-cent piece on the counter and tripped out of the store with the coveted cord.

—The B. C. Electric Employees' Magazine.

"Know Your Business" a Guide for Contractors

Treatise on Electrical Contracting Business Studied By Electragists in Southern California

"Know Your Business" would appear to be superfluous advice, but if such were the case there would be no need of bankruptcy courts because there would be no business failures.

To know accurately at all times the financial condition of your business spells the difference between success and failure. Business is based upon certain rules and laws which are inherent to any line of effort, whether it be a "hot-dog stand" or a million-dollar steel corporation.

To say that a man is unfitted for business is the same as saying that he will not put forth the necessary effort to learn the laws and rules of business.

Of course if the business is of such a nature as to warrant it, or is large enough, a man may apply himself to only one phase of the business and learn that thoroughly. Speaking particularly of the electrical contracting business, most men in the game are

former mechanics who have seen a chance, either real or imaginary, to make more money for themselves by entering business.

Starting upon a small scale, the natural desire is to keep expenses to as low a figure as possible until the business may have become established. This means that the embryo contractor will attempt to function in every capacity pertaining to his business.

If he has made a study of the laws aforementioned and erects his business upon the cornerstone of a first-class accounting system, which will keep him conversant with his financial status at all times, his little venture will have a fighting chance of surviving and growing with the years.

A business man is like the captain of a ship. He steers his course by the aid of his accounting compass and studies the chart of other men's failures so that he may avoid the rocks

National Association Sheet Metal Contractors

608 CHESTNUT STREET, PHILADELPHIA, PA.

THE FOLLOWING FORM FOR ASCERTAINING THE COST OF CONDUCTING BUSINESS, OR OVERHEAD, IS RECOMMENDED:

Some Local Associations have adopted the plan of having this blank filled in, without signature, or any identification marks, brought to the meeting and placed in a box. The "Price Committee" goes over these in open meeting for comparison.

Fill in amount for the three items enumerated below from your business for 192....

For Demonstration Purposes by the "Price Committee" at the meeting of

GROSS BUSINESS (This means your whole business) - - - - - \$.....

PAY ROLL (This means the money paid to those for whose services you made a charge) - - - - - \$.....

OVERHEAD, OR EXPENSE OF DOING BUSINESS - - - - - \$.....

This means the money paid for:

RENT \$.....

INSURANCE—Fire, Liability, Accident, Compensation, Etc. \$.....

TAXES—Water, City, County, State, United States \$.....

ADVERTISING \$.....

PRINTING, STATIONERY AND POSTAGE \$.....

TELEPHONE AND TELEGRAPH \$.....

TRADE AND DAILY PAPERS \$.....

MERCANTILE REPORTS \$.....

LEGAL EXPENSES—Attorney Fees, Etc. \$.....

COLLECTIONS \$.....

DUES TO TRADE ORGANIZATIONS, ETC. \$.....

CHARITIES AND DONATIONS \$.....

SHOP SUPPLIES FOR WHICH NO CHARGE IS MADE \$.....

LOST TIME OF WORKMEN—Time paid for but not chargeable to any job. \$.....

BAD DEBTS \$.....

ALLOWANCE—Reduction made to get settlement of account \$.....

DEPRECIATION—On Tools and Equipment \$.....

FREIGHT—Where not added to cost of material \$.....

CAR FARE—Where not charged to job \$.....

LIGHT—Gas, Electricity, Etc. \$.....

POWER—Gas, Electric, Steam, Etc. \$.....

HEAT—Gas, Coal, Etc. \$.....

HAULING—Where wagon or truck is owned by establishment, this would include all costs of operation, such as driver's wages, feed, repairs, etc. \$.....

SALARIES—Money paid to those for whose services no charge is made, viz.: Bookkeepers, Clerks, Porters, Errand Boys, Managers and Owners, (where the latter do not work on jobs, money they receive should go in this item) \$.....

ITEMS NOT LISTED ABOVE \$.....

Additional Copies of this Form will be mailed upon request to the National Association

Overhead, or the cost of conducting business, easily may be ascertained by filling out the chart shown above. This particular one is issued by the National Association of Sheet Metal Contractors, but it is entirely applicable to the electrical contractor's business.

of business disaster. He logs his position through the aid of his journal and ledger, which give him an accurate record of the business miles he has traveled.

The fundamental laws of business are matters of record, as many writers have written an untold number of books upon the subject. The need heretofore has been for a book which covered each law in a brief, concise manner, and in such clear and simple language that even the most unlearned could understand what it was all about.

The electrical supply jobbers of Los Angeles realized this need, and real-

ized also that their success was dependent upon the success and prosperity of their customers. In an effort to rectify the situation by supplying a book of this nature, and to erect a manumnt to the new spirit of co-operation between the branches of the industry, the jobbers prepared a paper entitled "Business Guide—Know Your Business."

This paper was presented to the contractors at the Lebec meeting of the California Electragists, Southern Division, in October. Those present asked that it be published in book form, and this has been done.

This co-operation with the "Better Homes" movement is only a part of the house-lighting work which the league is developing. In the early spring during the season of greatest building activity the Lighting Service Bureau began residence lighting work. From the building permit list the names of the owners of new houses were obtained. About one-third of the houses in the city are built by contractors in block lots for sale at cheap prices. These men are the most difficult to approach successfully. Their wiring has always been done in the cheapest manner possible, and their houses sell in spite of it; hence, the argument that better lighting is a selling point is disregarded. Gradually as the public is educated to ask for more, the contractors will give it; competition will force it, but progress is slow.

With the people building their own homes and with the architects, the work of the league is more productive. The women are glad to talk over their lighting problems with another woman; the architects are relieved to have their electrical wiring planned for them. In both cases, however, work must be done in a reasonable manner at a cost which will be commensurate with the cost of the house, or the people lose confidence.

It is impossible to measure the value of this work to the power company in terms of increased revenue, or to the electrician and the fixture men on the basis of increased sales. The financial gain is evident, of course, for there is seldom a plan drawn or a consultation held that does not result in many additional outlets. The women are glad to spend the money when they are convinced it either adds to the convenience or to the decorative value of their homes. But more noticeable than monetary gain is an increase in good will and a heightened interest in better lighting. For personal contact is publicity as well as service; and when the Bureau helps a woman solve her personal problem an interested convert to the whole movement for better home lighting has been gained.

Budget Used in Planning Salt Lake City Homes

Local Committee Opened to the Public Two Demonstration Homes Furnished Under a Rigid Budget Plan

By MARY DOOLEY, Lighting Service Bureau,
Rocky Mountain Electrical Co-operative League, Salt Lake City

Anyone that has been connected with a demonstration home movement, electrical or otherwise, realizes how open to criticism most demonstrations are on the score of extravagance. It is easy to exhibit everything desirable with no thought of initial expense or of maintenance. To place all the known electrical appliances in a home is not a difficult matter; to choose only the most necessary household aids, those consistent with a \$200-a-month income, is not so easy.

The Rocky Mountain Electrical Co-operative League felt that the "electrical home" of the past years had been called by many people impractical. The very thoroughness with which they were equipped made them objects of criticism. The budget system, which should be the fundamental idea in all demonstration homes, had been com-

In all the rooms center lighting was used, with additional bracket lights and lamps. The entire house was furnished for about \$1,800, including all furniture, rugs, draperies and appliances. An electric range, washer, iron, percolator and a toaster were considered the necessities in such a budget for the beginning housekeeper. A small ironer was exhibited also as a very desirable appliance which might be acquired by the owner later. The lighting fixtures were selected with economy in view, and, though inexpensive, they were very effective. There was nothing in the house that was not within the reach of a man earning \$200 to \$300 a month.

The more expensive house, designed to sell for \$10,500, including garage and lot, was a two-story, six-room English cottage, designed by Pope & Burton, architects. Bracket lighting was employed extensively, and in accordance with the increased budget more expensive fixtures were purchased. More appliances were included within the budget also, as it represented the outlay for a man earning \$400 to \$500 a month.

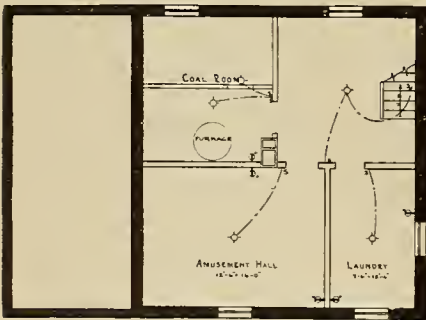


Fig. 1. Basement plan of the \$6,500 home demonstrated in Salt Lake City.

pletely disregarded. So that when an opportunity arose to co-operate with the "Better Homes in America" movement it was welcomed by the league.

In Salt Lake City the local committee opened two demonstration homes to the public furnished by the stores of the city under a rigid budget plan. The Rocky Mountain Electrical Co-operative League, through the Lighting Service Bureau, planned the wiring for the houses, which amounted to approximately three per cent of the total cost of the houses.

The house illustrated in Fig. 1 and Fig. 2 was designed to sell for \$6,500, including the lot. It represents a typical five-room home with a more convenient plan than is found in most of them.

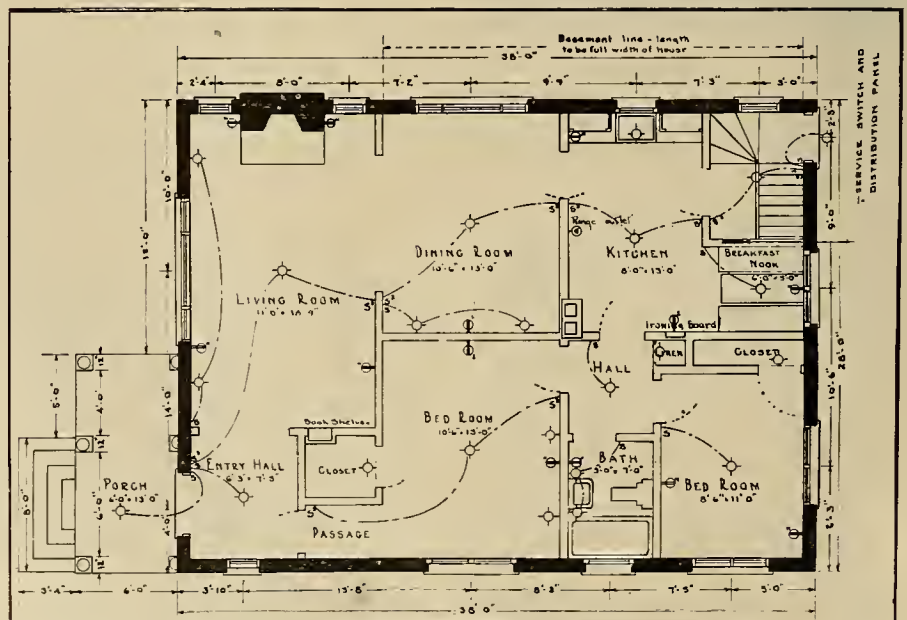


Fig. 2. Main floor. The wiring was laid out by the Lighting Service Bureau of the Rocky Mountain Electrical Co-operative League.



1

SALT LAKE CITY'S electric homes were consistent with moderate incomes. 1. The living room in the \$6,500 home; the inadvisability of placing brackets above the fireplace when the chimney is only 5 ft. wide was emphasized. Two brackets were placed flanking the window at the right of the picture, and the chimney space was left uncrowded. 2. Bedroom in this home; the electrician placed the brackets too high. It emphasized to future builders the necessity of planning accurately the height of brackets before the completion of the wiring. 3. An inexpensive center light hung over the table in the breakfast nook. 4. Sun room in the \$10,500 home. The wrought iron fixtures matched those in the dining room and living room. 5. The bedrooms in this home were lit by brackets and small lamps.



2



4



3



5

BETTER MERCHANDISING

Fair Booth Exhibit Marked by Unusual Features

Valley Electrical Supply Company of Fresno Gives Frozen Grapes to 10,000 a Day and Gains Much Good Will and Many Prospects

By J. U. BERRY, Advertising Manager, Valley Electrical Supply Company

More than 125,000 persons attended the Fresno County District Fair during the week of Sept. 28-Oct. 3. It is estimated that over 80 per cent of those in attendance entered the booth of the Valley Electrical Supply Company.

Among the special features to attract and hold the attention of the crowds were grapes which had been frozen in the Servel ice cream cabinet. These were handed out to everyone. A toothpick was stuck into each grape to make the handling more convenient and sanitary.

Over 18,000 frozen grapes were served the first day. From 5,000 to 10,000 were served every other day.

Hot waffle cookies and hot cakes were served in small portions. An Ever-hot electric fireless cooker was kept in constant operation baking hams and cakes which were served later.

Much interest was shown in a demonstration of the Hoover vacuum cleaner in which glass-front and slow-motion machines were used to show the inner workings and action of the machine. Other action displays included a washing machine in operation, also a picture showing steaming hot cakes and coffee.

Among the unusual things which brought forth many expressions of awe and wonder was the largest Hotpoint iron and the largest Headlite type electric heater in the world. The heater was a 10-kw. size and stood 6 ft. high, the current being turned on at intervals.

A horseshoe-shaped demonstration table proved a great convenience, rendering it possible for the demonstrator to exhibit and demonstrate the various appliances to a much larger group of people at a much closer range than otherwise would have been possible with the usual straight table.

An inviting color scheme and an abundance of light were responsible for the unusual pulling power of the booth. The general color scheme was done in turquoise blue trimmed in gold. The entire floor space was blocked off in 26-in. squares and painted in two shades of grey oil paint with a 1-in. black stripe between the blocks to give the effect of linoleum, thus helping to magnify the size of the booth space. A platform 3 ft. wide and elevated 13 in. above the level of the floor was placed around the full length of the booth at the back walls.

Wallboard covered with dark blue imported wall paper of an artistic and pleasing design, edged with a stenciled wallpaper border of black and gold, was made up in 24-in. panels, 7 ft. high. These panels were used as dividers for unit displays of ranges, washing machines, Servel refrigerators and Hoover vacuum cleaners on the platform. The panels were placed on the front of the platform and topped off with 12-in. lattice work interwoven with tinted artificial oak leaves. Back of the lattice directly above each unit display was placed a large X-Ray reflector with a 200-watt lamp. Lighting fixtures throughout the booth added an artistic finishing touch to the decorative scheme.

No merchandise was sold at the fair booth. However, orders were taken for future delivery and the names of many prospects were secured. No high-power methods were employed to secure these prospects, and the taking of orders for future delivery was not encouraged. The Valley Electrical Supply Company had the only exhibit at the fair where a complete line of electrical appliances was shown.

The only proper method of conducting a fair booth of this character is to create an atmosphere that is free from any high-power selling, one that will cause the prospect to feel freely welcome to enter the booth and receive courteous and intelligent information regarding the lines displayed. The Valley Electrical Supply Company has found through its experience with fair exhibits that the most successful display is that one where something new and unusual is featured, where some tasty dainty is handed out to the public. With the frozen grapes which were featured this year a pleasant surprise awaited each and every one who entered the booth, for these grapes frozen as they were to a frosty crisp were refreshing and delicious. The novelty of it will not be forgotten by those who partook of them.

It is rather difficult to estimate the good-will building value of this class of advertising, but when it is possible to get the attention of over 100,000 people in one week and get their attention under the most favorable conditions, at a cost of less than one-half cent per prospect, it is a very desirable form of advertising that is of unquestionable worth in selling the electrical idea and getting the name of the firm indelibly impressed on the minds of thousands of potential buyers of electrical merchandise.

Apex Company Changes Policy in Denver.—The Apex Electrical Distributing Company, Cleveland, has decided to discontinue direct retail sales efforts in Denver, according to announcement made by H. P. Whitten, Western manager. It is understood that in the future merchandising activities of the Denver office will be along strictly wholesale lines with distribution through some local jobber. This policy conforms to the practice of the company in the other Western states under the supervision of the Denver office.



Attractive display booth at the Fresno County Fair, maintained by the Valley Electrical Supply Company of Fresno. The booth was the only one in the fair to carry a complete line of electrical appliances and, though making no particular sales appeal, gained many prospects and created much good will. Nothing was sold at the booth, but many dainties, electrically prepared, were given away.

How Attractive Windows Can Stop the Crowds

What Qualities Must a Window Have to Stop the Passerby?

A Review of Some Windows Which Were Successful

Getting up an electrical window display which will stop crowds is not hard, but easy, with respect to origination or selection of the display idea. There are dozens of good display ideas around loose for anyone to use who will. Getting up a new display idea is not especially difficult. The hard part comes in executing the idea. Pains are required, real labor, often extra expense. Expenditure of the latter constituents by any electrical store or central-station salesroom can produce window displays with the "hit-them-between-the-eyes" quality.

What are the things about an electrical display which will stop a crowd? Mystery is one—baiting human curiosity. Novelty is one—capitalizing normal human interest in the new. Dramatic quality is a third—making the passerby wonder, "What's happening?" and to pause to find out. Once a window trimmer understands the possibilities in these three display qualities, he can decide almost infallibly in advance whether or not a given display idea will stop the crowd.

One of the best illustrations of the latter appeal seen lately was at the Boulder office of the Public Service Company of Colorado. Here was a display—a court scene, dolls being used—which immediately conveyed to the passer the drama suggestion. Obviously, something was happening. What was it? The crowd paused to find out. It read the display cards which, with the display, conveyed the story.

At the extreme right in the wide window was the "prisoners' dock," occupied by Dusty Broom, Ima Beater, and Carpet Sweeper. Standing near and indicating these as she addressed the judge was the prosecutor, saying, "Your Honor, the defendants are charged with beating the life out of A. Rug, with disrupting the American home and shortening the life of the housekeeper."

The conversation in this window was lettered on large cards, so-called "breather" style, by a veteran cartoonist and were suspended from above by practically invisible thread. The cartoon conversation effect was very realistic.

At the left of the judge's bench was the jury box, peopled with dolls, announcing their verdict, "We find the prisoners GUILTY." The judge was pictured saying, "I sentence you to be forever banished from the modern home. The court advises housekeeper to investigate the Hoover." Finally, at the extreme left a vacuum cleaner was displayed with a big card which read, "\$2 puts a Hoover in your home."

The Cartoon Window

Most "stop-the-crowd" windows require special labor. Another Boulder window, put in by W. G. Clary, floor man, necessitated special cartoon life-size cut-outs. A capable cartoonist is available in Boulder, and was turned to for the "Andy Gump" window.

The Gumps are perhaps among most popular cartoon characters conceived. When an electrical window uses them it establishes quick contact with a

large section of the public. The big Public Service Company window was divided into two rooms by a partition for this window. In one compartment Andy Gump was shown life-size surveying a washing machine. He shouted, "Oh, Min!" Min was portrayed doing the washing in the other compartment in the old-time way at the washboard. A card conveyed the final punch, that now better days would come.

Good novelty electrical windows have in them a quality approaching

ticularly effective for night use, as the passerby appears to see two washing machines placed end to end, with the suds in one defying the laws of gravity.

Adding a final touch to the display, a clothesline is stretched across the window, and cards shaped like pieces of clothing are attached to it with clothespins. On these cards matter describing special features of the washer is used.

The Atmospheric Window

Novelty is the outstanding quality of this window. So also is it that of a fan window put in last season by John West at the Denver office of the Public Service Company of Colorado. From a fur company he secured the loan of a giant stuffed polar bear. Electric fans in motion were shown. The polar bear, carrying the arctic suggestion powerfully, was an extremely novel thing to see in a public-utility window. In itself it practically guaranteed the success of the display.

Another fan display, which in a relatively small Western city sold thirteen fans the first day it was in, also used novelty, the presentation at the same time powerfully carrying the suggestion of cold. The trimmer with a brush and whitening painted snowflakes all over the front window. Toward the base of the window the effect of piled-up snow was created. Cotton over the window floor carried out the effect of snow. Then three fans, oscillating, with streamers, were shown. The display man spent two days constructing this display, bearing out the statement that perspiration is fully as important as inspiration in producing "stop-the-crowd" electrical displays.

Live Twins Draw Crowds

With some successful windows the principal obstacle may not be physical work of window preparation but that created by difficulty in locating needed material. A recent window at the gas and electric offices in Denver that blocked the sidewalk was featured by a pair of eighteen-months old twins. Dressed in their prettiest, they played in sand in the window. With cards a tie-up was secured with vacuum cleaners, which were exhibited in the win-

Police Stop Demonstration

On Horton Du-All Ironer
in Our Windows

Due to the fact that the remarkable demonstration of the Horton Du-All Ironer was attracting such crowds that the walk in front of our store was being blocked, the Police Department were obliged to enforce an ordinance giving them authority to stop window demonstrations that attract such crowds as to cause a blockade of the sidewalks.

NEVERTHELESS

We will continue the demonstration on the Horton Du-All Ironer the balance of this week on the main floor.

BRING IN YOUR IRONING AND HAVE IT IRONED
FREE

GEO. W. HUBBARD
HARDWARE COMPANY

A clever advertisement tie-in with a "stop-the-crowd" window that helped to create additional interest.

the "sensational" as applied to news, though "sensational" is too extreme a word to use. A good washing-machine window which can be depended on anywhere to stop crowds is built around a washing machine in operation and a big mirror. With soap and glycerine bright suds are made to fill the interior. The mirror is suspended above so that, looking into it, the passerby sees the suds. This display is par-



Dramatic interest created by a court scene in this Boulder, Colo., window of the Public Service Company of Colorado brought the passerby to a stop to see what was going on and incidentally to receive a sales message.

dow rear. In most communities the electrical man who started out to hunt up a pair of twins for such a purpose certainly would have his hands full. Lucky circumstances in the instance mentioned brought a parent of the twins into the company offices with an offer of his children for window-display purposes.

Of course, human objects per se are much more interesting to people than inanimate objects. Moving things, per se, are more interesting than stationary things. When this has been said, however, the matter reverts to the essential power of novelty in display. If twins were seen in electrical windows constantly, they would not stop crowds.

Mystery Always Attracts

Examples of good "mystery" windows are not so easily found. One such used at the time of the King Tut furore during the latter part of last winter was so mysterious in its presentation that people seeing it would cross the street to satisfy their curiosity. What the crowd saw was a window which, except for a doorway in the middle, wasn't a window but a mass of cracked rocks. Within, the whole window, except for the doorway in the center had copper board painted in the rock effect against the pane. The doorway was 2½ ft. wide and 6 ft. high. Steps led away from it. The floor of the window was covered with painters' cloth painted yellow. The sides and back were painted copper board in cracked rock effect, but more like a tomb. In the center was a box covered with canvas which was painted to look like a big rock. Along the front was a row of colored footlights, red, green and blue.

Every attempt was made—and with success—to create a very "spooky" atmosphere. The final furnishings were mummies. The artist used strips of copper board and painted them to resemble mummies. One was old King Tut, another was little Tut, shown with a couple of chariot wheels, and the third was Mrs. Tut. On the big rock in the center was a vacuum cleaner. Mrs. Tut was shown with an antique replica of a broom.

A suspended card read—"MRS. TUT WAITED 4,000 YEARS FOR HER HOOVER. HOW LONG ARE YOU GOING TO WAIT FOR YOURS?"

Curiosity prompted the crowd to look in the doorway. Then it was held by the novel quality of what it saw there. Novel! It was nothing else but that. That window kept big crowds before it.

Lighting Effects Useful

One thing an investigator repeatedly observes is this—one single window trick or method will often suffice to "put a window over." Suppose small appliances are on display—a range of items. Other than that it is tastefully decorated and there is no special compelling attribute of the window.

Through the evening hours there is assuredly a very simple method the store can use to bolster up the display—lighting effects. Whenever the Public Service Company at Boulder has a small appliance window, the fact is reflected in appliance sales. One such window recently was strengthened at night through an unusual light combination. Lights in one-half of the

window were red, in the other half blue. Coming up the street there was the red to compel attention, from the other direction blue, with a blending effect, depending on the passerby's movement, which, at a point directly opposite the window, produced a pure lavender effect. The lavender streak "got" people.

On another occasion the entire window was in a warm red. Across the street are premises not lighted at night. Against these the red light was reflected. Many pedestrians, seeing this reflection first, thought there was a fire in the vicinity and investigated—the small appliance display got attention.

At another Western Doherty property was a display which capitalized the possibilities in lighting effects. There was a "bathing baby" in the window—a window help furnished by a manufacturer. There was a cozy glow in front of this, and the baby was apparently lighted by it, bathed in a warm red. Actually a concealed spotlight, with a red screen, produced the effect. For the balance of the window green lights were used.

Green is a decidedly cold color. The contrast of the rosy "baby" in the chill environment was a striking advertisement for the appliance.

The Appeal of Old Junk

A queer streak of human nature makes possible a general group of electrical windows practically always "sure fire," yet not laborious to put in. Such are windows which use promiscuous heaps of old, junked appliances or fixtures. What it is that makes a used article inherently more interesting to a person than a brand-new article, showing no signs of use, is more or less beside the point. An old shoe is inherently more interesting than a brand-new one. An old appliance or fixture in a window draws interest like a magnet. Whose was it? What is its history? and other questions the onlooker instinctively thirsts to know the answer to.

When electrical stores have offered a stated or general allowance for old fixtures, percolators, toasters, etc., turned in toward new ones, and have heaped the "junked" items in the window, it has been observed that they always attract with their novelty and the properties of inherent interest just

mentioned. They are good "stop-the-crowd" windows from two angles. They not only stop—they sell merchandise.

Window results, since the question has been touched upon, deserve passing observation. On small appliances, good electrical windows will pull people in from the crowd actually to buy. On big objects like washers and cleaners, directly observable results are bound to be much less in number, the logical prospects in the passing crowd being much less numerous. However, any "stop-the-crowd" window on a washer or cleaner should increase definitely the number of inquiries and leads and be well worth the effort spent in preparing it.

El Paso Sales Department Studies Electric Refrigerators

Converting the regular weekly sales meetings of the sales department into a study course on electric refrigeration, the El Paso Electric Company, El Paso, Texas, intends to make the most of its opportunities in the sale of such appliances, according to W. R. Bell, sales manager.

The course offered salesmen is divided into six units, one unit being discussed and studied at each meeting. The course is supplied by the Kelvinator Institute, and is said to be very complete. It embraces not only the selling plan but explains in detail how the refrigerator is built and upon what principles it operates. Servicing of the machines also is taught.

Apartment's 25 Ranges Displayed in Salt Lake Office

A display of twenty-five Hotpoint electric ranges on the sales floor of its Salt Lake store, all of which were to be installed in a new apartment house, proved to be an effective method used by the Utah Power & Light Company in conveying to the public the message of electric cooking.

These ranges were displayed in an attractive manner on both sides of the section of the sales floor where they readily could be seen by everybody entering the store. They not only created interest in electric cooking, but assisted the owner of the apartment house in gaining publicity. A large sign told the story.



Previous to installation, twenty-five ranges sold to a new electric apartment house in Salt Lake City were placed on display on the floor of the Utah Power & Light Company store to show the popularity of electric cooking.

Santa Ana Officials Want to Eliminate Dark Signs

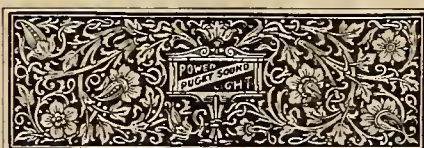
Aiming to improve the appearance of the city by the elimination of unlit signs on its streets, the board of trustees of Santa Ana, Calif., has passed an ordinance which provides that all advertising hangers which extend over any part of sidewalk or street and carrying illuminating lights or fixtures, must be kept lit between the hours of 7 to 9 p.m. during the months of October, November, December, January, February and March, and between the hours of 7:30 and 9:30 p.m. during the months of April, May, June, July, August and September.

Penalty for violation of the ordinance is provided in the shape of fines to be levied against the violator. In the case of continued refusal to comply with the regulations the electrical inspector of the city or his authorized agent may remove the sign and order the lights disconnected.

City Engineer Would Standardize Street Light Equipment

That the board of directors of Pasadena, Calif., have all future ornamental lamp posts made from a pattern originated and owned by the city is the recommendation that has been submitted to R. V. Orbison, city manager, by W. C. Earle, city engineer. This would make it possible to lower the cost of future installations and tend to improve the general appearance of the city streets.

Drawings of double and single light standards for business and residence streets were submitted by Mr. Earle with his report. He recommended that the standard post adopted be of cast iron.



THE New Year gives to all a new inspiration, new hope, new determination to do our tasks better, more worthily, with greater benefit to our fellow-men. . . . The spirit of the new age is cheerful helpfulness and good-natured consideration for the other fellow. . . . Even a large organization such as the Puget Sound Power & Light Company has the time and spirit to be friendly and "human". We are doing the best we know how; so are you; let's give each other a helping hand. . . . In the support of its business and industrial institutions lies the Prosperity of any community. We are grateful for the support rendered this organization; and through this new year and the years to come we hope to justify even more fully the splendid confidence that has been bestowed upon us. . . . With this spirit of tranquility and mutual helpfulness let's all pull together for 1925 and for the wider, deeper Prosperity that should ever bless this favored state.

A. W. Leonard

President, Puget Sound Power & Light Company



New Year's message of unusual power, dignity and feeling, published in the form of a large advertisement by the Puget Sound Power & Light Company last year, which sounded a keynote of service for the new year.

B. C. Utility Reduces Lighting Rates in Vancouver

Commercial lighting rates in Vancouver, B. C., have been reduced and placed on a demand basis by the British Columbia Electric Railway Company, effective Nov. 1. From a former flat rate of 5 cents a kw-hr. the rate has been reduced to 4½ cents a kw-hr. for the first step, dropping to 2 cents a kw-hr. for the second step. The first 100 kw-hr. per kilowatt of demand per month will be at the 4½-cent rate; all in excess will be at the rate of 2 cents. The former minimum charge of \$1 per kilowatt of demand for a month still applies.

In addition to these rates, discounts for large quantities are given on the primary rate, as follows:

First 1,000 kw-hr. per month, no discount. Next 1,000 kw-hr. per month, discount ½c per kw-hr. Next 1,000 kw-hr. per month, discount 1 cent per kw-hr. Next 1,000 kw-hr. per month, discount 1½ cents per kw-hr. Excess over 4,000 kw-hr. per month, discount 2 cents per kw-hr.

In estimating the maximum demand, electric signs and other exterior lighting are included to the extent of only 1/3 of the true value.

The new rates will be available to 8,000 commercial lighting customers. The majority of these have been paying a flat rate of 5 cents a kw-hr. with a minimum charge of \$1 per kilowatt of demand per month. A number of small offices still pay 6 cents

In order to make the new rate understandable as well as to encourage the use of current for electric signs, store window lighting and other additional uses, the power company has issued a 12-page booklet describing the effect of the new rate in general.



Portions of the floor display of the Denver office of the Public Service Company of Colorado. This company does a large merchandising business in its territory and, as the picture shows, believes in a well lighted and attractively arranged show room to increase sales. The arrangement of the showroom was planned by E. T. McSpadden.

NEWS OF THE INDUSTRY

Washington Agricultural Committee Lays Down 1926 Program

The Washington Committee on the Relation of Electricity to Agriculture at its executive committee meeting at Spokane, Wash., Dec. 7, adopted an intensive program for 1926. The committee has been active for one year, taken up principally by a study of typical rural lines in the state, under direction of L. J. Smith, committee secretary; Harry L. Garver, investigator; and approved by E. C. Johnson, chairman of the executive committee, all three men of Washington State College, Pullman. The work is being done on the basis of a five-year program handled as an agricultural experimental station project.

Following receipt and discussion of an exhaustive report on the 1925 survey, the executive committee outlined subjects for study and research for the coming year. As there are about 20,000 rural electrical users in the state, it was thought unnecessary for the Washington committee to organize an experimental line. The committee had viewed during the day a film showing the experiment at Red Wing, Minn.

The 1926 program contains a grading of the importance of the work, given the values of A, B, C, and D. They are as follows:

Subjects for Eastern Washington—

1. Development of a portable farm-community motor for use on an observation line at Pullman for silo filling, hay and straw baling, hay cutting, grain grinding and wood sawing. (C)
2. Development of a safe and more economical electrically heated water trough for use in winter where there is a large number of stock on a farm. (C)
3. To install and get data on a number of small pumping units for irrigation in the Wilbur district.
4. Studies on the monthly cost of operating kitchen ranges (coal and wood). (A)
5. Power consumption of electric incubators and brooders. (A)
6. Value of ultra violet ray in raising chicks. (A)
7. Study of power hay hoists and electrical refrigeration. (D)

For Irrigated (Central) Districts of the State—

1. Comparative studies of pumping with the electric motor and the internal combustion engine. (A)
2. Comparative studies of portable and stationary spray plants (electric and tractor). (B)
3. To develop labor-saving device for adjusting motor and pump to the varying levels of the Columbia River.
4. The use of electric power in orchards for frost prevention.
5. Saving of alfalfa leaves in baling (for the poultry industry).
6. Application of electric fan for night cooling of farm products in general, following apple-cooling bulletins.

For Districts West of Cascade Mountains—

1. Irrigation in the berry districts. (D)
2. Ultra violet ray for chicks. (A)
3. Irrigation for summer green feed for poultry and for garden stuff. (C)
4. To develop the use of a small power unit on the larger poultry farms. (B)
5. To extend the use of carrier devices to allow silos to be filled with a smaller motor. (B)

6. Studies of costs and utilizing small streams as sources of electric power and the success of present small installations.
7. Artificial curing of hay by means of circulation of heated air.

General Subjects—

1. Issuance of a circular on dimming devices and wiring for same for poultry houses. (A)
2. Centralization of the power requirements on dairy and grain farms. (B)
3. Cost data on pumping water for the farmstead and the application of fire protection on the farm. Application and cost of motors now installed. (A)
4. Study of power requirements for prune drying.
5. Preliminary work on the development of a small electric tractor for cultivating the small fields of the irrigated districts and western counties.
6. Fitting up a farm shop on each line with a shaft and electric motor to operate drill, blower, grinder, saw, etc. (C)
7. Reports and bulletins, studies and investigations outlined.
8. Study of the application of household appliances to the farmhouse. (B)
9. Electric fly extermination for milk houses, dairy farms and kitchens.
10. Development of motion picture study of the uses of electricity on farms in the state.
11. Development of fair exhibits.

Would Improve Flood Lighting on San Diego Park Tower

Plans are under way for more efficient and spectacular illumination of the "California Tower" in Balboa Park, San Diego. The matter was discussed at a recent meeting of the tourist and convention committee, San Diego Chamber of Commerce, and an outline of the proposed plans was presented by G. H. P. Dellman, of the San Diego Consolidated Gas & Electric Company, a member of the subcommittee on this project.

One suggestion under consideration is that the tower be lighted as it was during the Panama-California Exposition; that would call for sixteen floodlights and would require an outlay of \$1,172 during the first year.

The second plan involves the installation of eight 500-watt lights and twenty-four 250-watt lights at a total cost of \$1,650. This covers installation and one year's lighting, divided as follows: installation \$870; lighting \$780. Mr. Dellman believes the latter plan would be preferable and that it would warrant the additional expenditure required. A subcommittee of the Chamber of Commerce has been appointed to draw up detailed sketches for presentation to the Board of Park Commissioners.

The California Building tower recently was illuminated with temporary equipment under the auspices of the San Diego Electric Club. The illumination thus provided has served as a means of creating a desire on the part of the community to light the tower by more permanent and effective means.

Hoover Recommends Committee on Colorado River Question

Agreement among the states of the Colorado River basin that would permit the development of the resources of the river might be hastened, Herbert Hoover, Secretary of Commerce, told the Senate committee on irrigation and reclamation, which has before it the Swing-Johnson Bill, were a Congressional commission appointed for that sole purpose. Mr. Hoover in his testimony before the committee used as a basis for his remarks the estimate which puts the cost of the Boulder Dam at \$42,000,000 for construction, \$33,000,000 for electrical equipment, and \$27,000,000 for transmission lines. The aggregate of the various other items would make the cost of the project \$115,000,000.

"The people of southern California," Mr. Hoover told the committee, "recognize that the eastern and central states probably will not be anxious to find the whole \$115,000,000 for this development. The Californians, however, have expressed their willingness to make a substantial contribution to it coming from the municipalities and the private power companies. The federal government has a substantial obligation in connection with the development."

"Someone ought to be given authority to negotiate a definite financial contract which could be laid before Congress for ratification. . . . Our path would have been smoother had the Colorado River compact been ratified, but where we have such wide differences of view we must expect difficulties."

Mr. Hoover minimized the objection to the Boulder Dam based on evaporation losses. This will not become a matter of concern for seventy-five years, he declared, as all of the water in the Colorado cannot be used prior to that time. Then other dams will have been built which will have removed the objection.

Byllesby Contest Prize Awarded California Utility Man

A contest conducted by the Byllesby Engineering & Management Corporation in connection with the adoption of a manual of organization standards for field work in its construction department has resulted in the awarding of \$100 to L. M. Klauber, general superintendent of the San Diego Consolidated Gas & Electric Company, for the greatest number of useful suggestions.

The contest was held for the purpose of naming and constructively criticizing the new manual. "Field Organization Standards" is the name adopted.

City Power System Condemned by Farm Bureau Head

Maintaining that the farmer is sure to suffer from poorer service and higher rates if the existing light and power systems are broken into by the acquisition of profitable city business by municipalities, the California Farm Bureau Federation has filed with the State Railroad Commission a protest against the plan of the City of San Francisco to condemn and acquire the San Francisco distribution plants of the Pacific Gas and Electric Company and the Great Western Power Company. The protest declares that the condemnation should not be allowed unless a way can be devised to protect the rural districts against damage, and leaves to the Railroad Commission the difficult task of devising such a plan.

Presented by its manager, J. J. Deuel, the protest of the federation was made a part of the record in the condemnation case of the Great Western properties. The contention is strongly made, and supported by much evidence, that present rates and efficiency of service are the result of a policy of consolidation which has brought about the uniform load necessary to profitable operation at a reasonable rate. With the loss of city distribution loads, uniformity will be destroyed, resulting, according to the federation's contention, in increased costs of rural electrical service.

The valuation of the Great Western Power Company properties was placed at \$5,969,455 by R. M. Vaughn, valuation engineer of the Railroad Commission, after the depreciation figure had been subtracted. The original valuation of the same operating properties was \$7,463,072. The valuation of the Great Western's share of the properties of the Universal Gas and Electric Company, owned jointly by the Great Western Power Company and the Pacific Gas and Electric Company, was placed at \$2,280,136 with depreciation deducted, an original valuation of \$2,785,437.

Some of the more salient statements of the protest were worded as follows:

Electric service at the lowest feasible rates is vital to agriculture, and it is no less important to the cities that their back countries should so receive electric service.

The electric service of today requires coordination of widely separated generating plants. The business requires that the widely varying demands of many different classes of load shall be gathered together and fed from a common pool.

The action of the city of San Francisco in this case is a step backward; it represents retrogression, not progress—a splitting up of the system loads into its elementary parts.

Electric service in California is rendered by systems, not by cities. All elements are interdependent—each helps the others. San Francisco is proposing to condemn local properties and businesses; is proposing to take from consumers a part of that which now serves them. We have the right to demand that if such a proceeding is consummated, it must be upon a basis that will leave rural consumers forever as well off as they would otherwise have been.

If San Francisco should insist that electric service within the city be self-contained and separate from the interstate systems now in existence, the people of the state have the right to demand that San Francisco find some means to give to all other residents of California, at its own expense, a full and perfect equivalent forever.

We regard the proposal involved as a step backward. It is an effort to split apart rather than consolidate. It is a policy that on the average means higher rates and less efficient service.

Justice demands that country consumers must in such proceedings as this be given the

benefit of all doubts. They must not be required to assume the hazards of the future. Those hazards must be borne by the cities that make the hazards.

We submit furthermore that this proceeding is not an engineering matter, but a business and economic matter, and that after full consideration of all these matters, the commission find means to shape its decision that the farmers of California be left undamaged.

Puget Sound Co. Buys Power Property at Bremerton

As a climax to the acquisition of light and power properties on the Olympic peninsula in Washington, the Puget Sound Power & Light Company of Seattle has purchased the distributing system and other electric properties of the North Pacific Public Service Company, now operating in Bremerton, Charleston and Paulsbo, and will take possession Jan. 2.

The money involved in the establishment of what will be a new division on the Olympic peninsula, including the cost of the building of the station and laying of the necessary cables across the water amounts to more than \$2,000,000, according to W. H. McGrath, vice-president of the Puget Sound company. The transaction, which completes the company's purchase program as far as the Olympic peninsula is concerned, opens the way to the organization of a western district of the company with headquarters at Bremerton.

Included in the purchases made during the last sixty days have been the high-tension transmission line of the Northwestern Power & Manufacturing Company of Port Angeles; the distributing system and two power sites on the Dungeness River from the Sequim Light & Power Company, and the holdings of the North Pacific Public Service Company at Bremerton, the last named adding about 5,300 customers alone to the company's list. The area of the new territory acquired by the company is approximately 4,000 sq. mi.

The company announces that this new territory is to be linked to the great interconnected mainland system of the company by means of submarine cables. These cables, which will comprise two in the neighborhood of Edmonds at President's Point, and emerge at a point about halfway between Port Gamble and Keyport, will be connected with high-tension transmission lines with the existing transmission systems. The cost of the two cables is estimated at \$350,000, and they are to be ready to give service early in the new year. They will carry power from the company's new Baker River project. Each cable will be 26,000 ft. long and will have a total capacity of 20,000 hp.

Power Company Renames Plant in Honor of Engineer

The Southern Sierras Power Company of Riverside, Calif., by resolution at a special meeting of the board of directors has changed the name of one of its power plants to honor the late C. O. Poole, chief engineer of the company. The main part of the resolution declares, "that hereafter the Leevining Creek No. 1 plant shall be designated the Poole plant in recognition of the engineering skill and invaluable services rendered our associated companies by the late Charles Oscar Poole."

Arizona Makes Counter Proposal on Colorado River Water

Representatives of California and Nevada at a meeting held in Los Angeles Dec. 18 heard and unofficially rejected Arizona's answer to their proposal of a tri-state agreement on the development of the Colorado River, made in Phoenix, Ariz., Dec. 1. (Journal of Electricity, Dec. 15, 1925, p. 464.) A statement issued by the entire membership of the California and Nevada committees declared that "some of the Arizona proposals seem to us untenable but we are endeavoring to prepare a basis for further discussion with Arizona." Arrangements are being completed to bring the representatives of the three states together shortly after Christmas.

Arizona's counter proposal in effect ignores the existence of the Colorado River compact, drawn up in Santa Fe, N. M., in 1922. Other provisions of Arizona's answer are:

It specifically states that Mexico has no rights in the water of the Colorado River. The tri-state agreement does not mention Mexico.

It provides that water originating in a tributary of the Colorado River in any of the lower states belongs to that particular state. This agrees with the provisions of the tri-state agreement.

It allots 300,000 acre-ft. of Colorado River water to Nevada. This also is in accord with the tri-state agreement.

The remaining water in the river is to be divided equally between California and Arizona. This provision is looked upon as a serious obstacle in the way of arriving at an agreement concerning the development of the river as it is an apparent repudiation on the part of the Arizona representatives of all rights to the use of the water by the four upper basin states. The tri-state agreement made provision for an equal division only of the water allocated to the lower basin states by the Colorado River compact and not of the total flow of the river.

Ownership in all dams, hydroelectric power plants, and engineering works shall vest wholly in the state or states in which these properties are located. Royalties or taxes may be collected by the state or states in which these plants are built. A provision is made whereby the United States government may build these various projects for the states and have the states refund the money later.

Course in Public Utilities to Be Given by U.S.C.

Metropolitan College of the University of Southern California has announced that beginning in December a course in public utilities will be made available to the people of the industry living in Los Angeles. The course will run for three months, at a total cost of \$10, with the class meeting each Monday evening from 6 to 7:30 o'clock.

George J. Eberle, professor of statistics and public utilities at the University of California, will conduct the class. Professor Eberle is a member of the firm of Eberle & Riggleman, consulting economists and statisticians. He formerly was connected with the Wisconsin State Railroad Commission and a special consultant of the Canadian Railways.

Los Angeles G.E. New Buildings Soon Ready for Occupancy

Offices of the southern California division of the General Electric Company are being moved into their new headquarters at Santa Fe Avenue and 52nd Street, Los Angeles. The two-story office building, which has just been completed by the Austin Company of California, provides twenty-six well lighted and ventilated offices with the most modern equipment throughout. Inter-communication phones, a pneumatic tube system connecting with the adjoining warehouse and service station, and a complete electrical heating system already have been installed. The building is an L-shaped structure, 110 x 96 ft., of brick construction, with an ornamental stone front.

Work on the large three-story warehouse now under construction by the Austin Company is progressing rapidly, and the building will be ready for occupancy soon after the first of the year. When the warehouse is finished and equipped the General Electric Company's Los Angeles plant will represent an investment of approximately \$1,000,000, and that city will be made one of the principal distribution points of the company.

The warehouse, which is now being erected by the same company, is a class A building, 240 x 80 ft., and is

of brick, concrete, and steel construction. This building is being finished to three stories with allowances made for an additional story. The warehouse will be equipped with six traveling cranes of five-ton and three-ton capacity and other devices for handling the heavy electrical machinery. The unit also will be equipped with two large freight elevators.

The new unit is on a five-acre tract recently purchased by the General Electric Company and adjoining the present service building. The various activities of the company will be consolidated, and provision is being made for future expansion. The plant will be the last word in modern efficiency, labor saving and cost reduction in the handling of volumes of electrical equipment ranging from incandescent bulbs to transformers, motors, generators and other heavy electrical equipment.

The new unit of the Los Angeles plant is expected to be finished soon after the first of the year.

Acting for the General Electric Company in the negotiations and working out the engineering features with the Austin Company of California were G. E. Emmons, one of the former company's vice-presidents, J. A. Cranston, the Pacific Coast manager, and S. E. Gates, manager of the General Electric Company's Southwest operations.

Would Stop San Joaquin Storage Projects on Kings River

Seeking court action to prevent the San Joaquin Light & Power Corporation from carrying out contemplated storage of the waters of the Kings River in central California in connection with its Kings River hydroelectric development, two complaints have been filed in the superior court at Merced, Calif. The East Side Canal & Irrigation Company and James J. Stevinson, Inc., the two complainants, claim rights to the natural flow of the San Joaquin River from which each derives water for irrigation.

The East Side Canal & Irrigation Company asserts a riparian right and lays claim to exclusive privilege of diversion of 500 sec.-ft. from the San Joaquin River and contends that the power project of the San Joaquin Light & Power Corporation will result in failure of any water to reach the irrigation company's canal at certain times. This water from the Kings River reaches the San Joaquin River through Fresno Slough, the complaint recites.

The Stevinson corporation asserts itself entitled to the natural flow of the Kings River. Neither of the complaints affects in any way the Balch plant now under construction by the San Joaquin Light & Power Corporation, as no storage is contemplated in connection with this plant.

Forest Fires Cause Interruption to Santa Barbara Service

Forest fires in the mountains between Casitas Pass and Ojai, about five miles south of Santa Barbara, caused an interruption of several hours duration to the electrical service for that city on Nov. 20.

Two 60,000-volt transmission lines of the Southern California Edison Company supply the electrical energy for the city. One of these, a wood pole line from Castaic substation, was burned so badly that it will be necessary to rebuild several sections. The other, a steel tower line from Satcoy substation, was not damaged seriously although some of the insulators were broken down and in a few places the conductor was severed by the extreme heat. No accurate estimate of the cost of the damage done is possible at this time, but an approximate figure has been set at \$3,000.

Permit for Fresno County Sector of Vincent Line Sought

The Southern California Edison Company on Nov. 17 filed an application with the county supervisors of Fresno County for a franchise for its new transmission line across Fresno County from Cascade, the headquarters camp of the company's Big Creek-San Joaquin project, to Orange Cove, at which point the line enters Tulare County. The supervisors made the first move in the granting of the franchise by passing a resolution authorizing the county clerk to take the preliminary steps required by law.

This franchise, which covers a period of fifty years, will take care of the Fresno County sector of the Vincent line, the third Big Creek-Los Angeles 220-kv. transmission line. Preparatory work on the Los Angeles end of this line was started a short time ago.



New offices and warehouse of the General Electric Company in Los Angeles, now being completed by the Austin Company of California. Top—The office building, already completed, showing the warehouse in course of construction in the rear. Bottom—Interior of the lobby in the office building.

Army Chief of Engineers Reports on Power Resources Survey

In his annual report to Congress on the survey of the electric power plants and resources of the United States that was commenced during the fiscal year 1922 the Army Chief of Engineers states that "it was desired by this means to obtain information and to develop plans which would enable the nation to utilize to the utmost all available electric power in time of war, and to assure the fairest and most efficient distribution to industries which would be engaged in work essential to the prosecution of hostilities."

He continues:

The objects of the survey are to collect data on existing power companies of over 5,000-kw. capacity; to establish contact with the principal men in the power-production business; to seek the co-operation of producers in so planning their extensions and new developments as best to meet war-time needs; to ascertain the possibilities of increased power development in combination with navigation improvement, flood control, or otherwise; and to ascertain the best system for the government to adopt for developing power resources and for administering power distribution in a national emergency. Especial emphasis is being laid on close co-operation with the large power producers and interests, as it is realized that only in this manner can a successful system be devised. Duplication of work done by other government bureaus is being avoided, and every effort is made to utilize existing data to the fullest extent practicable.

An initial survey of the situation for the entire continental United States has been completed, and a report based thereon was during the year transmitted to, and approved by, the Assistant Secretary of War. The plan contained in this report contemplates the division of the country, for peace-time investigation and war-time administration, into eleven territorial power zones. During peace-time, the necessary work and investigation in each power zone will be under a division or district engineer located therein. Annual reports will be submitted by these, and based thereon, the chief of engineers will transmit annually to the Assistant Secretary a project, revised up to date, for co-ordination and administration of power resources in an emergency.

Spirit Lake Company Files for Large Power Development

Two separate sets of applications filed at the state hydraulics office in November by Joseph Roane of Vancouver, Wash., and by R. B. Metcalfe, of Portland, Ore., both for the Spirit Lake Railway & Power Company, would develop water power in Cowlitz County at an estimated cost of \$10,700,000, it was announced by R. K. Tiffany, supervisor of hydraulics.

Upon six independent sites for which filings were applied, a total of 121,600 continuous electrical horsepower would be developed, requiring from two to three years to build the plants on account of the large dams required and the extensiveness of the flumes, canals and power-house equipment.

The four largest units of the power project for the Spirit Lake concern were filed by Mr. Roane, whose projects would cost \$7,700,000 and would develop 72,000 hp. All would take water from the Toutle River.

His applications apply in the first instance to the Roane unit which would cost \$1,500,000 to develop and would furnish a total of 13,200 hp. A 30-ft. dam, 80 x 120 ft., fed by 600 sec.-ft. of water, would impound water for the first unit. The second would be known as the Elk Rock project and would be built at a cost of \$3,000,000, developing 29,000 hp. A 9-mile canal and a dam 15 ft. high and measuring 200 x 275 ft., would be required in this case. Green Canal, third of the projects, would cost but \$700,000, and would fur-



John B. Fiskien presenting Insull Medal to Howard Dynan, of Copco.

nish 6,800 hp., utilizing a dam 15 ft. high and 250 x 300 ft. in size. Also calling for a 9-mile canal and the completion of a 250 x 300-ft. dam is the Alder project outlined by Mr. Roane. This plant would cost \$2,500,000 to complete, furnishing 23,000 hp.

The filings for the company by Mr. Metcalfe would expend the sum of \$3,000,000 in the development of two power sites furnishing a total of 49,600 hp.

These two applications, following a reservoir permit already granted to the Spirit Lake Railway & Power Company, of which Mr. Metcalfe is president, would use 10,000 sec.-ft. from joint intakes off the Green River and Hoffsteadt Creek, and in the second application would appropriate 500 sec.-ft. from the Toutle River, of which the two streams in the first application are tributaries.

Two dams are needed in the first of the applications, the Green River dam specifications calling for a concrete dam 75 ft. high, with bottom and top measurements of 80 and 140 ft., respectively. The Hoffsteadt Creek dam would be 40 ft. high with a top length of 110 ft. and 50 ft. at the base. The Toutle River dam, necessary in the second project outlined in the applications, would have a height of 8 ft. with a length along the top of 250 ft. and be 125 ft. at the base. A total fall of nearly 1,100 ft. would be utilized in the two projects, it was represented in the applications. The Toutle River plant would contribute 15,000 hp., as compared to the total output of 34,600 hp. from the combined hydroelectric apparatus to be installed on Hoffsteadt Creek and Green River.

It was stated that the power generated would be used for mining, lighting, transportation and general utility purposes.

Fiskien Makes Insull Award to Copco Employee

Answering in the affirmative the Biblical query, "Am I my brother's keeper?" John B. Fiskien, consulting engineer, The Washington Water Power Company, Spokane, in his capacity of Northwest representative on the accident prevention committee, Technical National Section, N.E.L.A., in awarding the Insull Medal to Howard Dynan, foreman of line gang of the California Oregon Power Company, showed beyond all question the duty people owe one another in worthwhile works of safety.

The Insull Medal was presented to Mr. Dynan for saving the life of a fellow employee, Burt T. Green, who had received an electric shock while working on a switch structure at the West Side plant of the company, Klamath Falls, Ore., June 3, 1925. (Journal of Electricity, Dec. 15, 1925, p. 465.)

In making the award, Mr. Fiskien concluded with the following remarks:

This, Mr. Dynan, is a token of the appreciation of a grateful industry; may you live long to enjoy it and may you never again be placed in the position where you can merit another reward, but if you are, may your efforts meet with a like measure of success.

This medal and this certificate are presented to you as a reward, but the greater reward I feel sure will be found in the knowledge that you have fulfilled your obligation as your "brother's keeper," and that through your act a brother man continues to live in the enjoyment of his wife's smile and his children's laughter.

Peace has its victories no less than war; we honored the brave boys who went "over there" for the purpose of destroying lives, those of our country's enemies. We should equally honor the man who applies his bravery, his coolheadedness and his acquired knowledge not to destroying life but to preserving it.

Boulder Dam 300 ft. High Is Recommendation of Merrill

With the avowed intention of attempting to put through the Swing-Johnson bill at this session of Congress various members of the Senate Committee on Irrigation and Reclamation opened public hearings on the first day of Congress. The first witness was O. C. Merrill, the executive secretary of the Federal Power Commission. His testimony was confined almost entirely to the discussion of the height of the dam in Boulder Canyon that would be best suited to the development of power and at the same time contribute to flood control. Mr. Merrill is to be recalled to present a plan for financing the project. He is opposed to the Swing-Johnson bill, but in case Congress should approve federal participation he has worked out a plan whereby the federal government can lend its credit to the project without withdrawing money from the treasury.

Mr. Merrill told the committee that the Boulder Dam should exceed 300 ft. in height by as few feet as could be agreed upon to prevent excessive loss of water by evaporation. A dam 300 ft. high would confine the reservoir to the canyon itself. Under such conditions evaporation losses would be less than 100,000 acre-ft. per annum. If the dam were built to the maximum height proposed, evaporation losses from a broad shallow reservoir would be as much as 700,000 acre-ft., which would mean the loss of enough water every year to irrigate 200,000 acres.

Portland Electric Power Company Issues House Organ

A new arrival among the utility-company house organs or employees' magazines is that of the Portland Electric Power Company, Portland, making its first appearance with the November, 1925, issue. This issue is a 16-page magazine, 7½ x 10½ in., containing special articles and departmental material. It is to be published monthly entirely by regular employees of the company, with Fred L. Brace, editor, and George J. Kelly, business manager. Associate editors listed are: Marguerite Butler, Gladys Robinson, Harry P. Cramer, A. H. Kruehl, Gordon Steele and O. C. Burbott. As yet it has not been named, there being a prize of \$25 offered to the employee submitting the best title.

The first issue contains articles by Franklin T. Griffith, president, A. C. McMicken, sales manager, and William Strandborg, editor of "Watts Watt," a company publication circulated on its street cars. Departments include "The Family Wash," "The Women's Page," "What's Doing in Our Stock Yard," "Keeping Up," "Just Between Us," "Sports," and "Shear Nonsense." An excellent view of the Oak Grove development of the company adorns the front cover.

New 44-kv. Transmission Line to Half Moon Bay

Application was made recently to the Railroad Commission by the Great Western Power Company of California for permission to construct a new 44-kv. transmission line in San Mateo County, Calif. This line is to extend from a connection with the San Francisco system of the company at the northern line of San Mateo County some twenty-two miles to Half Moon Bay.

Construction work is planned to start immediately, and the line is expected to be ready for operation some time in April. Initial construction will provide for an ultimate of two lines on a single pole line. Only one line will be strung at first. The total length of the line is to be 22 miles. Plans call for the erection of 19 miles of steel poles and 3 miles of wood poles. Coincident with the erection of the transmission line is to be the construction of two substations. One of these substations will be an 11/44-kv. step-up station at the San Francisco end of the line and the other will be a 44/11-kv. step-down station at the southern end of the line. Total cost is expected to be in the neighborhood of \$160,000.

Load growth in the Half Moon Bay section made necessary the construction of a second line feeding into this territory. The new line will provide an additional transmission capacity of 5,000 kva. for the region. This will suffice for the present, and when the load demands the second circuit will be strung on the same pole line.

New 110-kv. Line Planned From Tekoa, Wash., to Kellogg

Construction of about 67 miles of 110-kv. transmission line from Tekoa, Wash. to Kellogg, Idaho, has been undertaken by The Washington Water Power Company of Spokane, Wash., replacing the present 60-kv. No. 2 Coeur d'Alene line of that company. The new line will follow a new right-of-way from a connection on the present transmission line of the company south of Spokane to Chatcolet, Idaho. From there it will be built on the same right-of-way to Kellogg, Idaho.

Two-pole construction will be used and the line entirely rebuilt. When this line is built and a seven-mile stretch in the Coeur d'Alene district is replaced, the entire transmission system from the Long Lake power station will be operated at 110 kv. better to serve the large silver-zinc-lead district of the Idaho panhandle. The new plan when completed will give the company transmission lines of 110 kv. from the most extreme eastern and western limits of its territory.

San Diego Company Opens Office in La Mesa District

Opening of the new La Mesa district office of the San Diego Consolidated Gas & Electric Company, San Diego, Calif., Dec. 15, was announced by A. E. Holloway, superintendent of the commercial department. The new office will serve the districts of La Mesa, La Mesa Heights, Grossmont, Spring Valley, Jamacha and Lemon Grove, with E. R. Hollingsworth as district representative.

A feature of the La Mesa branch will be a permanent display of electric ranges, water heaters and other domestic appliances.

With the object of bringing the company and its rural customers into a more personal relationship, branch offices are being established as rapidly as volume of business and community growth permit. The company now maintains district offices at Oceanside, Escondido, Coronado and La Jolla, Calif.

"Busy Buttons" Turns on Street Lights at Fillmore

Celebrating the turning on of the newly installed ornamental street-lighting system of more than 100 standards on its main streets, the citizens of Fillmore, Calif., on Dec. 11 staged a unique entertainment which took the shape of an old-timers' parade. Old lanterns of every description and vintage were used to illuminate a grand parade and carnival which took place prior to the actual turning on of the current. Practically everyone in the city of Fillmore, together with invited guests from all over Ventura County, participated in the old-timers' parade.

Lanterns, lamps and even old-fashioned candleholders that had not seen the light of day for two generations



"Busy Buttons", in the person of little Miss Alice Keiffer, turns on the street-lighting system in Fillmore, while G. E. Gaylord, division superintendent, Southern Pacific Company, C. Arrasmith, city manager, and W. H. Price, mayor of Fillmore, look on.

were brought out and polished up for the occasion. All other lights had been turned off while the parade passed through the streets, and at a prearranged signal "Busy Buttons"—little Alice Keiffer, daughter of Robert Keiffer, manager of the Southern California Edison Company's Fillmore branch—threw the switch, which by a prearranged signal, flooded the streets with light in startling contrast to the futile glimmerings of the ancient lamps and lanterns.

L. S. Lotheridge, manager of the Southern California Edison Company's Santa Paula district, which includes Fillmore, threw his entire organization into the work of making the electrical features of the party function properly. E. M. Husher, superintendent of the Santa Paula district of the Edison company, and R. S. Woods, of the substation maintenance department, planned the hookup of the dummy switch and the necessary signal system which enabled "Busy Buttons" to light up the entire town with one move.

Fire Destroys Power Plant in Akron, Colo.—Akron, Colo., recently was without power and lights for several days as a result of an explosion and fire which practically destroyed the power plant of that city. Peter Yost, chief engineer, and Arthur Raymond, fireman, were injured in the explosion but recovered. Work was under way cleaning carbon out of one of the engines when the explosion occurred, but the exact cause of the blast was undetermined. Total damage was estimated at \$50,000.



The new Contra Costa 110-kv. substation of the Pacific Gas and Electric Company, as it appeared Dec. 9, 1925

Federal Company to Construct Cowlitz River Project

A large hydroelectric power plant on the Cowlitz River in Washington will be constructed by the Federal Light & Traction Company, parent company of the Grays Harbor Railway & Light Company of Aberdeen, Wash., according to announcement of W. W. Briggs, general manager of the Grays Harbor company. Work will be started on the new plant as soon as the necessary permits are granted by the state supervisor of hydraulics.

The first unit of the plant at Mayfield, Wash., will develop 38,000 kw., and when the complete development is effected, the total output will be 100,000 kw. This power will be brought from the Cowlitz River to Grays Harbor and will be available to Aberdeen, Hoquiam and Cosmopolis on Grays Harbor, and to Raymond and South Bend on the Willapa Harbor and adjacent territory. Immediate development work is expected to cost \$2,500,000. The work is planned in three units, the second, which will be known as the Mossy Rock Unit No. 2, will consist of a dam 300 ft. high in Young's Canyon, tunnel, pipe line and power house just below, and a lake 15 miles long, with ultimate capacity of 84,000 kw.; the third unit will be the Big Bend Unit, which will develop 30,000 kw. (Journal of Electricity, Aug. 15, 1925, p. 147.)

Portland Lighting System Makes Downtown Bright Spot

Pictures showing the contrasting street lighting under the old and new systems of street illumination were made recently in Portland upon the completion and turning on of a new street-illumination system on Broadway of that city. Views were photographed at night both before the new lighting system had been turned on, and again at one minute after the new system had been illuminated. The accompanying illustrations show plainly the relative illumination of the street, the crowds who witnessed the ceremony of turning on the new system being plainly visible on the streets.

The new system in Portland along Broadway is arranged to place six standards to the block, three on each side of the street, placed in parallel, a total of 106 for the seventeen blocks of the lighting district. Each standard contains two units of 15,000 lumens each, giving an average intensity of 2.85 foot-candles on the pavement and

665 lumens per linear foot of street. (Journal of Electricity, Aug. 15, 1925, p. 148.)

The pictures were taken by W. C. Foster, assistant operating engineer, Portland Electric Power Company, which received the contract for the installation and operation of the system for five years. Jagger, Sroufe Company, electrical contractors, Portland, installed the system under a sub-contract.

Opposition to Jacobs Bill Shown in Legislative Session

At the legislature now in session in Olympia, Wash., public ownership was hit twice recently when the house public utilities committee recommended the indefinite postponement of the Jacobs Bill, which would allow municipal light plants to sell current outside the city borders, and at the same time recommended for passage the Trunkey Bill, which would require the city of Seattle to submit bonds to the voters before building another unit of the Skagit. The Trunkey Bill was recommended for passage by a vote of seven to four, after three Seattle councilmen had urged its defeat.

In the face of the adverse decision, Representative B. F. Jacobs amended his power bill to take in additional territory, and announced that he would carry his fight to the floor of the house in the form of a minority report signed by himself and E. E. Halsey, chairman of the committee.

The Municipal League of Seattle recently voted opposition to the Jacobs Bill.

Two Power Employees Overcome in Mine Disaster in Colorado

In the mine fire and threatened disaster near Nederland, Colo., early in December that entombed twenty-eight men underground for nearly twenty-four hours, a number of employees of the Public Service Company of Colorado served with the rescuers.

Headed by F. S. Henderson, local manager of the company at Boulder, a crew went to the mine soon after the fire was reported and attempted to restore power service after the flames had consumed the mine power plant and the company's transformer station maintained at the mine. Wayne Potts and August Riche, employees of the company, were overcome while engaged in rescue work but were brought to the surface in time and later recovered.

Interior Mexican Town Installs Modern Power Plant

In the heart of old Mexico has been installed recently one of the most modern and complete generating stations of small size, supplying light and power to a rapidly growing town of 10,000 inhabitants, according to the Westinghouse Electric & Manufacturing Company. The installation is that of the Cia de Hielo y Luz Electrica de Panuco, S. A.

The operating company was formed recently by Panuco citizens to furnish light and power to the community, hitherto practically without electric service. The installation consists of two turbo-generators of 500-kw. combined capacity, delivering three-phase,



A view of one of the two generating units of the Mexican company with C. Ruiz, manager, alongside. All pipes and conduits are underground.

60-cycle, 2,400-volt power. The generators are driven by the latest type turbine running under 200 lb. steam pressure, 100 deg. superheat, and discharging into surface condensers under a vacuum of 28 in. of mercury. Operating speed of the generators is 900 r.p.m.

The plant is located ideally at the edge of the River Panuco, from which circulating water is obtained by pumps placed in a 50-ft. concrete pit, the latter being necessary to compensate for the varying water level during the extreme seasons. During flood periods the level of the river frequently rises to within a few feet of the concrete foundation of the plant, when the pumps operate under a considerable head.

B. C. Electric Railway Company Rates Cut 60 Per Cent

Announcement has been made by W. G. Murrin, vice-president of the British Columbia Electric Railway Company, Vancouver, that, effective Dec. 1, the following new power and light rates have been put into force:

"The first 65 kw-hr. per month per horsepower will be three cents per kw-hr.; the next 65 kw-hr. per month per horsepower will be two cents per kw-hr.; and the remainder one cent. Even on these rates there will be a discount for installations of over five hp., which will materially reduce the first, or three-cent, step. The existing rate for small-power installations is five cents per kw-hr., dropping to two cents after a certain consumption, irrespective of the size of the installation. The same principle will be put into effect in our new commercial lighting rates and in a similar way in our domestic lighting rates."



Before and after. Left: Broadway, Portland, Ore., looking south from the Electric Building, corner of Alder Street, a few nights before the new ornamental lighting system was turned on. Right: One minute after the lights were turned on, Nov. 24, showing crowds assembled to witness the ceremony.

Separate Company for Western Electric Supply Business

Under the name of Graybar Electric Company the electrical supply business carried on by the Western Electric Company has been set apart from the telephone manufacturing business and incorporated. The Western Electric Company has been both the manufacturing company of the Bell System and a distributor of electrical supplies. The new corporation is the result of the fact that both those lines of business require specialized organization and specialized management and that the rapid expansion of the supply department made an entirely separate corporate identity necessary.

The name "Graybar" is derived from Gray & Barton, a partnership formed in 1869 between Elisha Gray and Enos M. Barton for the purpose of manufacturing electrical equipment, and the predecessor of the Western Electric Company.

The Graybar Electric Company will continue the sale of all devices and materials which constituted its business under the Western Electric name and will continue to market equipment of Western Electric manufacture, such as telephone train dispatching apparatus, intercommunicating telephone systems, lead-covered cable and similar material.

The new company has fifty-five distributing houses in important cities, one of the largest being that in San Francisco at 680 Folsom Street, of which W. S. Berry is manager.

A more complete account regarding the formation of the Graybar Electric Company will appear in the Jan. 15 issue of the Journal of Electricity.

San Francisco Electrical League Holds Kiddies Day

The annual Kiddies Day party of the San Francisco Electrical Development League was held Monday, Dec. 21, at the Palace Hotel. A total of 105 youngsters from the poorest families in San Francisco were selected by the Salvation Army to attend the party as the guests of the League. Members of the League, their wives, sisters and women friends played the part of parents of each of the youngsters on this day.

E. G. McCann acted as chairman in the absence of C. B. Kenney, president of the League. The program was broadcast over KPO, and several of the stars assisted in the entertainment, including Big Brother, Gypsy and Marta; Mrs. Crowe, director of KPO programs was also present. Howard Milholland of KGO led the community singing. Santa Claus distributed gifts to all of the youngsters.

The League supplied the Salvation Army with money to buy the youngsters clothing and presents; the clothing was distributed before the party. A sight-seeing bus was used to transport the youngsters to and from the hotel.

The following committee was in charge of the party: chairman—Arthur Rowe, Garnett Young & Company; vice-chairman, E. G. McCann, Pacific Gas and Electric Company; A. H. Nicoll, Western Electric Company; R. MacDonald, Fobes Supply Company; Victor Lemoge; C. D. Slaughter, Allied Industries, Inc.; Fred Todd, Pacific States Electric Company; Charles Musladin, Alexander & Lavenson Electrical Supply Company; R. St. John, Simonson

and St. John; Arthur Dahl, Chas. W. Dahl and Son; J. T. Stewart, Stewart Electrical Manufacturing Company; L. Leurey; Clyde Chamblin, California Electrical Construction Company; Don Ray, Pacific Gas and Electric Company; E. E. Browne, Electrical Contractors and Dealers' Association, and George Barker, Allied Industries, Inc.

Committee Organization Rocky Mountain Division N.E.L.A.

The committee organization of the Rocky Mountain Division of the National Electric Light Association, as of Jan. 1, 1926, is announced as follows: President—C. A. Semrad, Public Service Company of Colorado, Denver.

General National Committees

Educational—W. N. Clark, Southern Colorado Power Company, Pueblo.

Insurance—D. E. Bent, Tucumcari Light & Power Company, Tucumcari.

Membership—George E. Lewis, Public Utility Information Committee, Denver.

Rural Electric Service—F. F. McCommon, Public Service Company of Colorado, Denver.

Wiring—S. W. Bishop, Electrical League of Colorado, Denver.

Accounting National Committees

Section Chairman—J. E. Loiseau, Public Service Company of Colorado, Denver.

Vice-Chairman—W. J. Benning, Southern Colorado Power Company, Pueblo.

Accounts Payable—B. L. Wiles, Albuquerque Gas & Electric Company, Albuquerque.

Accounts Receivable—F. C. Scott, Southern Colorado Power Company, Pueblo.

Classification of Accounts—John Connell, Public Service Company of Colorado, Denver.

Fixed Capital—W. J. Benning, Southern Colorado Power Company, Pueblo.

Purchasing and Storeroom—H. P. Tewksbury, Public Service Company of Colorado, Denver.

Statistical Methods—E. E. Sherman, Public Service Company of Colorado, Denver.

Commercial National Committees

Section Chairman—J. A. Clay, Western Colorado Power Company, Durango.

Vice-Chairman—G. B. Buck, Public Service Company of Colorado, Denver.

Cooking and Water Heating—W. E. Fleetwood, Western Colorado Power Company, Telluride.

Customer Relations—H. E. Hartzell, Public Service Company of Colorado, Boulder.

Industrial Lighting—C. E. Addie, Public Service Company of Colorado, Denver.

Merchandising—G. B. Buck, Public Service Company of Colorado, Denver.

Power—L. C. Moore, Southern Colorado Power Company, Canon City.

Public Relations National Committees

Section Chairman—W. C. Sterne, Municipal Properties Investing Company, Denver.

Vice-Chairman—J. J. Cooper, Mountain Electric Company, Denver.

Co-operation with Educational Institutions—Herbert S. Sands, Westinghouse Electric & Manufacturing Company, Denver.

Customer Ownership—Guy W. Faller, Public Service Company of Colorado, Denver.

Industrial Relations—V. L. Board, Public Service Company of Colorado, Denver.

Information Bureau Organizations—J. J. Cooper, Mountain Electric Company, Denver.

Public Speaking—A. C. Cornell, Western Electric Company, Denver.

Relations with Financial Institutions—E. A. Phinney, Jefferson County Power & Light Company, Golden.

Women's—Miss Inez E. Thompson, Public Service Company of Colorado, Denver.

Technical National Committees

Section Chairman—H. H. Kerr, Public Service Company of Colorado, Denver.

Vice-Chairman—W. D. Johnston, Mountain States Power Company, Casper.

Accident Prevention—F. A. Tewksbury, Public Service Company of Colorado, Denver.

Electrical Apparatus—H. H. Burt, Public Service Company of Colorado, Denver.

Hydraulic Power—L. Y. Sears, Public Service Company of Colorado, Denver.

Inductive Co-ordination—Ralph Hubbard, Public Service Company of Colorado, Denver.

Meter—William Quandt, Southern Colorado Power Company, Pueblo.

Overhead Systems—G. Brannan, Cheyenne Light, Fuel & Power Company, Cheyenne.

Prime Movers—R. F. Throne, Public Service Company of Colorado, Denver.

Underground Systems—M. M. Koeh, Public Service Company of Colorado, Denver.

News Briefs

Lumber Mill to Be Electrified Completely.—The Bloedel-Donovan Lumber Mills, Bellingham, Wash., according to statement of J. H. Bloedel, president, will be electrified completely at once. The work will cost about \$75,000 and require two and a half months. Half of the mill was electrified ten years ago.

Utah Power & Light Company Buys Green River Utility.—The steam electric plant and distribution system of the Green River Electric Light & Power Company at Green River, Wyo., has been purchased by the Utah Power and Light Company. Approximately 600 customers now are receiving service from this plant.

Denver Trying Out Electric Traffic Signals.—Additional sample installations of electric traffic signals have been made in Denver. Six different makes of signals now are being tried out. An appropriation of \$50,000 has been made in the city's budget for next year covering the purchase of a suitable system.

Denver to Remodel Park Electric Fountain.—The electric fountain which has proved one of the chief attractions to summer visitors in the City Park of Denver is to be remodelled. Most if not all of the interior pipe and wire installation located under the fountain in a big lake will be replaced, according to Eli M. Gross, superintendent of parks.

California Oregon Power Company Authorized to Issue Stock.—The California Oregon Power Company has been authorized by the California Railroad Commission to issue on or before Dec. 31, 1926, \$1,000,000 of its six per cent cumulative preferred stock, to be sold at not less than 92 per cent of par value, and to use the proceeds for construction purposes and reimbursing applicant's treasury.

Puget Sound Company Applies for Power and Light Franchises in Kitsap County, Wash.—The Puget Sound Power & Light Company, Seattle, has made application for power and light franchises in Kitsap County, Wash., which will permit of bringing in power from the new Baker River plant. It is proposed to cross Puget Sound with the power line and enter Kitsap County near the northern boundary. It is declared the move is a first step to furnish Bremerton and the Puget Sound Naval Yard there with the company's power service.

Two Transmission Line Licenses Issued by Commission.—A license has been issued by the Federal Power Commission to the California Oregon Power Company of San Francisco covering a 34,000-volt transmissions line to serve the Victory Gold Mines in the Klamath National Forest. That body also has issued to The Washington Water Power Company of Spokane a license for a 110-kv. transmission 163 miles long to extend from the company's Long Lake power house to its Brewster substation. This company also has applied for a license to cover a transmission 5.70 miles long in the Coeur d'Alene National Forest.

P.C.E.A. News

Meeting Schedule of Technical Section Conclave Issued

The schedule of meetings of the conclave of the Technical Section of the Pacific Coast Electrical Association, that is to be held at the Fairmont Hotel, San Francisco, Jan. 13-15, has been announced by R. R. Cowles, chairman, as follows:

Committee	Wed. Jan. 13	Thurs. Jan. 14	Friday Jan. 15
Accident Prev'tn.....	10 a.m.	9:30 a.m.	
Elec. Apparatus.....		9:30 a.m.	9:30 a.m.
Hydraulic Power.....	10 a.m.	9:30 a.m.	
Inductive Co-ord'n.....			9:30 a.m.
Meters.....	10 a.m.	9:30 a.m.	
Overhead Sys.....	10 a.m.	9:30 a.m.	
Prime Movers.....	10 a.m.		
Safety Rules.....			9:30 a.m.
Underground Sys.....			9:30 a.m.
Executive Com. 6 p.m.			4:00 p.m.
Luncheon.....		12:15 p.m.	
General Meeting.....			8:00 p.m.

Reservations for accommodations should be made direct with the hotel, with mention of the Pacific Coast Electrical Association.

Detroit Accident Prevention Meetings Outlined

By J. M. BUSWELL

Chairman Accident Prevention Committee
P. C. E. A.

Ten members of the accident prevention committee of the N.E.L.A., in addition to the chairman and the secretary, were in attendance at the Detroit meetings Oct. 8 and 9. Included in these was W. R. Frampton, who represented the chairman of the P.C.E.A. committee of like name and

work. The prime object of this particular meeting was to review the work of the coming year.

Announcement was made to the effect that all reports of the Technical Section must be in headquarters by Feb. 22, 1926. This is necessary if these reports are to be in time for publishing prior to the annual convention at Atlantic City May 17-21, 1926. The chairman pointed out that this necessitated the reports of the divisions of the accident prevention committee being in the hands of the chairman by Feb. 15.

Of particular interest to the Pacific Coast Division are the following specific subjects in which participation has been requested:

(a) Safe methods for construction or alterations and for operation of equipment.

(b) Grounding methods.

In addition it is of interest to note that the following subjects were assigned to the Pacific Coast Division at the national accident prevention committee meeting held in New York Sept. 15 and 16.

(c) Safe practices.

(d) Identification of cables.

(e) Accident prevention course for foremen.

While the Pacific Coast committee had taken up all of these subjects with the exception of grounding, a progress report was all that could be made in time for the national committee's Nov. 10 meeting. On this subject of grounding, the national committee already has been informed of the appointment of the joint committee on this subject which is to represent the safety rules, apparatus and overhead systems committees of the Technical Section, P.C.E.A. It is expected that this joint committee will co-operate with the national committee referred to, either directly or through the ac-

cident prevention committee of the P.C.E.A.

In the national committee discussions as well as in the discussions of the Pacific Coast committee there is found a general desire for the submission of suggested safe practices along various lines. For instance, a direct effort is to be made to obtain suggested safe practices for construction, installation and reconstruction, for fire-fighting, for grounding, tree-trimming, overcoming various steam-plant hazards, identification of cables, unloading and handling of poles, guarding excavations, truck operation, and for reducing various public hazards. It is hoped that every member of the Pacific Coast Electrical Association not only will feel free to assist the accident prevention committee by making suggestions relative to safe practices of which experience has indicated the necessity or desirability but will feel that it is his duty.

Synopsis of Meter Committee Detroit Meetings

By W. R. Frampton, representing R. G. Jones,
Chairman Meter Committee, P.C.E.A.

No special reports were submitted at these meetings as they were primarily organization meetings. Some subjects were discussed tentatively and plans were made for the assignment of definite work to each of the geographical divisions. In the interests of economy brief and concise reports were urged by C. F. Hirschfield, chairman of the Technical National Section.

Twenty-two standing subcommittees have been arranged for. These are separated into divisions and each division is assigned a distinct part of the work of each subcommittee. The subcommittees are as follows:

1. Handbook for electric metermen.
2. Current for electricity meters.
3. Bureau of standards circular 56.
4. Ruling of regulatory bodies.
5. Educational work.
6. Meter and installation department.
7. Laboratory standards and testing instruments.
8. Methods of metering.
9. Metering accuracy.
10. Meter testing.
11. Auxiliary testing apparatus.
12. Low-tension installations.
13. High-tension installations.
14. Demand power factor and special meters.
15. Instrument transformers.
16. Switchboard meters, instruments and relays.
17. Transportation.
18. Meter standardization.
19. Meter problems.
20. Experimental and research work.
21. Publicity and publications.
22. New developments.

Northwest Electric Light & Power Association

Committee to Concentrate on Electric Water Heating

The energies of the electric cooking and heating committee for the current year will be devoted to contributing what it can with the means at its disposal to knowledge on the subject of electric water heating. This was decided at a meeting of that committee, Dec. 4, 1925, at Portland, where various possible subjects for study were discussed. It was found that the sale of electric ranges by member companies was pretty well standardized, and with a special committee working on the range survey in the Northwest it was felt that nothing of value could be contributed on this subject beyond what was common knowledge now and what would be disclosed by the final report of this survey.

In turning to the subject of water heating the committee recognized its limitations in the absence of funds with which to carry on a comprehensive test, but decided that through a study of existing loads and revenues derived therefrom by different com-

panies some valuable conclusions might be reached with respect to certain phases of the subject.

Accounting Section to Hold a Group Meeting Feb. 1

The Accounting Section will hold a general group meeting in Portland, Feb. 1, 1926, to which all members are invited and at which certain subjects have been assigned for discussion as follows: inventories, credits, distribution records, simplified forms of annual reports, and adaptability of machines to accounts payable records and to payroll distribution. Each of these subjects is within the scope of study of a different subcommittee, and the plan is to have a member of the committee responsible for the subject present a paper on it to form the basis for further discussion.

This is the first such group meeting ever held by the Accounting Section between conventions, and it is expected that the material developing in it will form the basis for the reports of that section at the convention.

A. I. E. E. News

San Francisco Section will hold its next meeting Friday evening, Jan. 15, at 6 p.m. at the Fairmont Hotel. It will be a joint meeting with the technical section of the Pacific Coast Electrical Association. Following dinner, the regular meeting will convene at 7:30 p.m. "The Use of Modern Mechanical Equipment for Transmission-Line Construction" is the subject of a paper to be presented by J. A. Koontz, electrical engineer of the Great Western Power Company.



News of the Electragists



San Francisco Association to Hold Annual Banquet

The sixth annual banquet of the San Francisco Association of Electrical Contractors and Dealers will be held in the roof garden at the Hotel Whitcomb, Saturday, Jan. 16, 1926, at 6:30 p.m.

The following have been appointed on the committee in charge: chairman—Walter Mobley, American Electrical Engineering Company; Charles Shipman, Atlas Electric Company; Edward Dowd, Dowd-Seid Company; D. M. Carlson, Central Electric Company; and Gus Baraco, Old San Francisco Electric Company.

Tickets are \$5 per plate and can be secured from any member of the committee or at the office of the Association, 522 Call Building, San Francisco. Reservations must be made not later than Tuesday, Jan. 12. A badge will be exchanged for each ticket as the guests arrive and this must be worn in order that those in attendance may go in and out of the hall.

Members of the electrical fraternity are invited to attend, and 300 are expected. Out-of-town visitors who plan to be present and desire rooms at the hotel are requested to make reservations through the committee or the Association.

California Electragists to Meet at Catalina in January.—The next quarterly meeting of the California Electragists, Southern Division, will be held at Catalina Jan. 23-24. W. F. Brainerd, California Electrical Bureau, and C. J. Geisbush, executive secretary of the Electragists, have been appointed as a committee to take care of the details of the convention. These will be announced in the Jan. 15 issue of the Journal of Electricity.



Walter Scott of Burlingame, one of the members of the committee on standardization of local ordinances of the California Association of Electrical Inspectors. This committee will report at the meeting of the Association to be held in San Diego in March.

Electrical Contractor-Dealers of Stockton Organize

In response to a letter sent to the electrical contractors and dealers of Stockton, Calif., by E. H. Grogan of the Stockton Plumbing Supply Company, representatives of eight different firms met in the headquarters of the Builders Exchange and formed an organization.

After disposing of the necessary preliminary business, the following officers were elected: president—George Taylor, Hild Electric Company; vice-president—G. Grider, Grider Electric Company; secretary—W. J. Collins; treasurer—E. H. Grogan, Stockton Plumbing Supply Company; trustees—Charles Bass, Commercial Electric Company; W. H. Murphy, Bright Spot Electric Company; E. Suplick, Eddy Electric Company.

Meyer's Electric Company, Coachella, Calif., has moved into a new store building recently completed by F. H. Meyers, the proprietor.

Morgan Electric Company, formerly at 1322 E. 14th Street, San Leandro, Calif., has moved into a new store at 1104 E. 14th Street. L. E. Morgan is manager of the firm.

W. J. Collins, 708 East Market Street, Stockton, Calif., secretary of the Stockton Contractors and Dealers' Association, recently has become a member of the California Electragists.

H. L. Miller Company, electrical contractors of Pasadena, Calif., has completed the installation of the electrical equipment for the broadcasting station KPSN of the Pasadena Star-News.

J. W. Lane of the J. W. Lane Electric Company, Long Beach, Calif., has just completed the wiring of a model home which is to be shown under the auspices of the Long Beach Press Telegram. The home is wired completely in every way and exceeds the Red Seal specifications.

Taylor Electric Company operated by F. W. Taylor has moved from its former location at 112½ North Spadra Street, Fullerton, Calif., to a new store at 118 Commonwealth. Mr. Taylor specializes in industrial installations and his slogan is "complete electrical installations for light, heat and power."

The Stolper Electric Company, H. L. Stolper proprietor, of Burbank, Calif., has just opened a new store. Mr. Stolper has been established as a contractor in Burbank for some time and his new retail establishment is a credit to the town. The formal opening was held on Nov. 14 and was attended by a large number.

H. H. Courtright and Frank Thomas, Valley Electrical Supply Company; T. M. Robinson, E. E. Elzea, Electric Motor Shop; L. G. Jeffrey, Electric Construction Company; and George M. Rankin, California Electrical Bureau, all of Fresno, were in attendance at the meeting of the California Electragists, Northern Division, held at Sacramento, Dec. 5.

Red Seal License Granted to the Electric League of Colorado

Coincident with the change in name to the Electrical League of Colorado on Nov. 1, announcement was made by the Electrical Co-operative League of Denver, Colo., at that time of the award to it of a license to operate the Red Seal plan. Denver is the twelfth city to be issued a license by the Society for Electrical Development and the only one thus far to qualify between St. Paul, Minn., and the Pacific Coast.

Following newspaper announcements of a news nature on Sunday, Nov. 1, about the Red Seal plan, the first application for a Red Seal home was made the following morning and will apply to a \$30,000 residence to be built near Denver's first electric home. As a matter of interest it is reported that the applicant was one of the bidders for the electric home when it was exhibited over three years ago.

Newspaper advertising already has been started by the Colorado league on the Red Seal plan and literature outlining minimum wiring requirements will be available for distribution shortly, according to S. W. Bishop, manager of the League.

Weekly Meetings Being Held in San Diego to Discuss State Safety Orders.

—Meetings for the purpose of discussing the Electrical Safety Orders of the Industrial Accident Commission are being held weekly over a period of two months by San Diego electrical contractors and the city inspection department. The decision to hold these meetings was reached following a meeting of the contractors, the inspection department, supply dealers, and representatives of the San Diego Consolidated Gas & Electric Company. The Orders have been adopted by San Diego as standard for all wiring done in that city. With all contractors making installations in uniform compliance with the State Safety Orders, inspection will be facilitated greatly.

C. B. Kenney, Ne Page, McKenney Company, San Francisco, was in Portland and Seattle on business lately.



L. C. Stoll, of the L. C. Stoll Electric Shop, Bakersfield, is president of the Electric Contractor's Security Alliance of that city and devotes a considerable part of his time to association activities.

Meetings

Lighting Committee Lunch Club Talk Launched Auspiciously

Simultaneously in meetings of the electric clubs of Oakland, Los Angeles and San Diego the special luncheon club talk on "Artificial Light," as prepared by the lighting committee, Commercial Section, P.C.E.A., was launched under auspicious circumstances Monday and Tuesday, Dec. 14 and 15. In each case large groups heard the talk, and declared it one of the best prepared and best presented efforts in its field of endeavor.

The lighting talk constitutes the major work of the lighting committee for the year's program. It was carefully prepared by the committee, headed by Clark Baker, assistant manager, Pacific Division, National Lamp Works, and chairman of the committee. Condensed into briefest and tersest possible form, the talk reviews the achievements of illuminating engineers in the control and use of artificial light. It is of an educational nature and has been prepared with the intention of having it presented at the leading luncheon clubs of the state by members of the lighting committee. After the luncheon clubs have heard the talk, its activity will be extended to such schools, clubs, and other organizations as desire it, and it probably will be broadcast over the radio.

The talk is accompanied by a demonstration of some of the uses of artificial light in medicine, industry, commerce, and the home. It takes into account the physical structure of the eye and the effect of light on it. Glare and gloom are shown to be dangerous, and the effect of poor light on school children is set forth dramatically. A specially constructed light box, built like a miniature stage, is used to make the demonstrations, the entire paraphernalia of the talk having been designed ingeniously to enable its easy portability from one town to another.

At the Oakland Electric Club the talk was given by Robert Prussia, Westinghouse Lamp Works, with Clark Baker, chairman of the committee, adding a few remarks at the conclusion. The talk was commended highly by members of the Electric Club at the conclusion of the demonstration, and co-operation was pledged to get the talk placed before all the luncheon clubs of the East Bay communities.

In Los Angeles Dr. Arthur Hoare, professor of applied optics of the Los Angeles School of Optometry, gave the lighting committee talk to the Electric Club. C. A. Sanborn, of Holmes and Sanborn, construction engineers of Los Angeles, was chairman of the day, acting in the place of William Baurhyte, who was absent on account of illness.

G. H. P. Dellmann, lighting sales engineer, San Diego Consolidated Gas & Electric Company, gave the talk to the San Diego Electric Club, on Tuesday, Dec. 15, to a good crowd. Mr. Dellmann is scheduled to give the talk to the Rotary Club of San Diego in January, and plans to repeat it to the

other luncheon clubs of the southern part of the state.

The San Francisco Electrical Development League is to hear the talk at its Jan. 4 meeting, program arrangements having made it impossible to hear the talk there simultaneously with other electric clubs of the state.

Seattle Engineering Societies Hold Joint Meeting.—A joint meeting of the Seattle sections of the American Society of Civil Engineers, American Institute of Mining and Metallurgical Engineers, American Society of Mechanical Engineers and American Institute of Electrical Engineers was held in Seattle Dec. 15 at the Chamber of Commerce Auditorium. The principal address was on "The Skagit Power Project," and the speakers were Joseph Jacobs, Stirling B. Hill and W. C. Morse, engineers who were members of the Skagit Engineering Commission. An informal banquet and program of entertainment were provided.

Mountain States Auditors Meet.—District auditors of the Mountain States Power Company, representing the states of California, Oregon, Washington, Idaho, Montana and Wyoming held a two-day session at the general headquarters of the company in Tacoma, Wash., Dec. 17 and 18. The meeting was primarily for the purpose of discussing accounting methods and devising systems that will facilitate the accounting of the various branches of the company. Those who attended the meeting included E. Rosenauer,

Company, was presented to the presiding officer, David M. Roderick. "Drew" Griswold and the A. G. company were the donors, and Harry J. Martin, past president of the club, made the presentation speech. The gavel, made of fiber and brass, bore the name of the club's president, and hereafter each presiding officer's name will be engraved on the gift.

Change Plans on Rocky Mountain N.E.L.A. Meeting

Instead of the usual midwinter meeting of the N.E.L.A., Rocky Mountain Division, a section and committee conference will be held at Idaho Springs, Colo., Jan. 25 and 26. Previous meetings have been held jointly with the Colorado Public Service Association and the Rocky Mountain Committee on Public Utility Information in Denver.

This year Charles A. Semrad, president of the Rocky Mountain Division, and the members of the executive committee arranged the two-day conference in the hope of crystallizing division policies and developing a definite program, especially along commercial lines.

The meeting will be held at the Hot Springs Hotel and the program shows morning, afternoon and evening sessions, without any scheduled entertainment. The officers hope to have representatives from all of the leading central stations in the Mountain section attend the conference which, for the first time, will feature consecutive reports of all sections and committees rather than concurrent meetings where interest would be divided.

Arrangements are being handled by J. A. Clay, chairman Commercial Section; J. E. Loiseau, chairman Accounting Section; H. H. Kerr, chairman Engineering Section; W. C. Sterne, chairman Public Relations Section, and O. A. Weller, division secretary.

Both Messrs. Semrad and Sterne attended the recent national executive committee meeting of the N.E.L.A. in Chicago and will make a report of the matters considered at that meeting.

COMING EVENTS

Technical Section, P.C.E.A.—

Conclave—Fairmont Hotel, San Francisco
Jan. 13-15, 1926

California Electragists, Southern Division—

Quarterly Meeting at Catalina, Calif.
Jan. 23-24, 1926

Rocky Mountain Division, N.E.L.A.—

Section and Committee Conference
Idaho Springs, Colo.
Jan. 25-26, 1926

Western Association of Electrical Inspectors—

Chicago, Jan. 26-28, 1926

National Association of Railroad and Utilities Commissioners—

Kansas City, Baltimore Hotel
Feb. 9-12, 1926

Accounting Section, Northwest Electric Light and Power Association—

General Group Meeting, Portland, Ore.,
Feb. 1, 1926

American Institute of Electrical Engineers—

Midwinter Convention in New York
Feb. 8-12, 1926

Electrical Men of Colorado—

State-wide meeting under sponsorship of
Electrical League of Colorado
Denver, March 26, 1926

Pacific Coast Electrical Association—

Annual Convention—Biltmore Hotel, Los Angeles
June 8-11, 1926

Stockton, Calif.; B. E. Lee, Albany, Ore.; A. S. Blanchard, Marshfield, Ore.; C. C. Clare, Tillamook, Ore.; E. A. Nelan, Casper, Wyo.; F. B. Marshall, Kalispell, Mont.; D. M. Shreve, Sandpoint, Idaho; C. E. Leshner, Everett, Wash.; Martin Sands, D. V. Johnson, Harry Anderson and W. L. Fitzpatrick, all of Tacoma.

Gavel Presented to Seattle Electric Club.—At a recent meeting of the Electric Club, a gavel, manufactured in the plant of the A. G. Manufacturing

Book Reviews

ELECTRICITY AND THE STRUCTURE OF MATTER

By L. SOUTHERNS, M.A., B.Sc. Lecturer in Physics in University of Sheffield.
7 x 5 in. 123 pages. 33 Figures. Cloth. \$1. Oxford University Press, American Branch, New York, N. Y.

The volume is one of a series of introductory works prepared for the general education of the reader. It is written in a simple style and in the first part deals with the history of the discovery of an experimentation with electricity. With this general background the author goes into the application of electricity, giving many of the interesting uses of this form of energy.

While of a non-technical nature the work is suitable as a basis for an elementary understanding of the broad field which it covers. The book should prove interesting to the reader seeking a general idea of some of the facts concerning the application of electricity.

Personals

Howard A. Lewis, well known to electrical men as one of the outstanding leaders in the field of electrical appliance distribution, has announced his resignation from the McGraw-Hill Company to become director of sales of the Electric Refrigerating Corporation. This is the new holding company that will effect the combination of the Kelvinator Corporation and the Nizer



HOWARD A. LEWIS

Corporation, both leading manufacturers of electric refrigerators of Detroit, and the Grand Rapids Refrigerator Company. Mr. Lewis for eight years has been manager of "Electrical Merchandising," and as such has been a close student of the domestic electrical appliance market and a pioneer thinker in the problems of distribution and resale. In his new affiliation he becomes one of the foremost figures in the organization of this rapidly expanding branch of the appliance industry. Mr. Lewis entered the electrical industry on the Pacific Coast when, just out of Leland Stanford University in 1910, he joined the old Pacific Electric Heating Company of Ontario, Calif., later known as the Hotpoint Electric Heating Corporation. In 1911 he went East in charge of the New York district of the company. In 1914 he opened a London office and organized the European business. In 1915 he returned and took over the Chicago office in addition to New York, to which later was added the Canadian company, so that his territory embraced everything East of the Rockies. With the consolidation of the Hotpoint and Hughes organizations to form the Edison Electric Appliance Company in 1917, Mr. Lewis joined the McGraw-Hill Company, seeing an opportunity to give his energies to the promotion of the better merchandising of electrical appliances at a time when the true possibilities of the market were just beginning to dawn on the manufacturing world. From that time to this he has been one of the shrewdest analysts of the economics of electrical distribution and one of the most outspoken advocates of efficient resale practice, addressing many audiences and writing many

papers on aspects of the problem. During 1919 Mr. Lewis was also business manager of "Electrical World."

F. V. Lindsey has been appointed sales manager of resistance materials by the Driver-Harris Company, Harrison, N. J. Mr. Lindsey has been identified with the manufacture of nickel and nickel alloys for a great many years, having been vice-president and secretary of the Electrical Alloy Company previous to its purchase by the Driver-Harris Company.

C. F. Phillips has been appointed representative in charge of the Wilkes-Barre office of the Allis-Chalmers Manufacturing Company. Mr. Phillips, who was formerly connected with the Philadelphia office of the company, succeeds Guy V. Woody.

Lafayette Hanchett was re-elected president of the Utah Power & Light Company at the annual meeting of the board of directors held in the general offices of the company in Salt Lake City Dec. 3. In addition D. C. Green was re-elected vice-president and general manager; J. F. MacLane, vice-president and general counsel; George B. Thomas, secretary and treasurer; R. H. Jones, assistant secretary and treasurer. Church P. Castle, who has been prominently identified with business activities in Salt Lake City and the Intermountain territory during the past fifteen years, and is a director of the National Copper Bank, was elected to the company's directorate.

George E. Quinan, chief engineer of the Puget Sound Power & Light Company, Seattle, recently addressed the Electric Club of Seattle on "The Growth of Electricity in the Puget Sound District."

F. F. McCammon, head of the power sales department of the Public Service Company of Colorado in Denver, has been named head of a committee appointed to report upon the relative merits of the various traffic signal systems, samples of which are now being demonstrated in Denver.

Lewis A. Lewis, sales manager, The Washington Water Power Company, Spokane, in his capacity as president of the Northwest Electric Light and Power Association and a member of the executive committee of the National Electric Light Association, made a trip to Chicago in order to attend a meeting of the executive committee recently.

J. B. Fisk, consulting engineer, The Washington Water Power Company, Spokane, recently addressed seventy-five employees of the Mountain States Power Company, Albany, Ore., on the subject of accident prevention and resuscitation. On the following day he talked to 500 engineering students and faculty members of the Oregon Agricultural College, Corvallis, Ore., on the same subject.

A. C. McMicken, sales manager, Portland Electric Power Company, Portland; L. A. Lewis, sales manager, and L. R. Gamble, assistant engineer, The Washington Water Power Company, Spokane; J. F. Orr, sales manager, and F. J. Rankin, chief engineer, Idaho Power Company, Boise; and P. M. Parry, commercial manager, and R. M. Blake, superintendent merchandise sales, Utah Power & Light Company, Salt Lake, attended the recent meeting of the cooking and heating committee, Commercial National Section, N.E.L.A., held in Salt Lake City.

H. H. Schoolfield, chief engineer, Pacific Power & Light Company, Portland, a short time ago visited New York City on company business.

Prof. C. D. Marx, emeritus professor of civil engineering at Stanford University, Palo Alto, Calif., has become chairman of the Engineering Foundation's committee on arch dam investigation. Professor Marx succeeds Prof. Charles Derleth, Jr., of the University of California, Berkeley, who has resigned.

W. S. Etheridge, formerly assistant sales manager, Edison Electric Appliance Company, Chicago, has been made general sales manager for the Hamilton-Beach Manufacturing Company, Racine, Wis.

J. S. Moulton, assistant to the executive engineer, San Joaquin Light & Power Corporation, Fresno, Calif., was a recent visitor in San Francisco on business. While there he attended the monthly meeting of the Electric Transportation Association.

Eliot Conrey, formerly with the Pacific Gas and Electric Company, San Rafael, has become affiliated with Curtis Lighting of California, Inc., San Francisco, as sales engineer. Mr. Conrey will work with salesmen of the power companies, jobbers and contractor-dealers.

D. E. Harris, president of the Pacific States Electric Company, was a recent business visitor in Los Angeles.

H. H. Walker of the H. H. Walker Company, electragist, W. L. Frost of the Southern California Edison Company and Frank Weiss of the Los Angeles Gas and Electric Corporation, all of Los Angeles, were in San Francisco recently attending meetings of the N.E.L.A. committees and the advisory committee of the California Electrical Bureau.

W. S. Gifford, president of the American Telephone & Telegraph Company, General J. J. Carty, vice-president, and J. D. Ellsworth, assistant to the president, were recent visitors in Salt Lake City.

S. E. Gates, Los Angeles branch manager of the General Electric Company, was a recent visitor in San Diego.

E. J. Cipperly, industrial heating specialist for the General Electric Company, spent several days in San Diego not long ago.

Hoyt Catlin, formerly advertising manager, Bryant Electric Company, Bridgeport, Conn., will enter the advertising agency business as associate and production manager of E. T. T. Williams and Associates, New York City, Jan. 1, 1926. At one time in his career Mr. Catlin spent two years in the Yakima Valley, Wash., in the employ of the Pacific Power & Light Company, Portland.

Ray Turnbull, Seattle representative of the Edison Electric Appliance Company, has gone East on a business trip, which will include New York and Chicago.

Harry Byrne, president North Coast Electric Company, Seattle, recently left for a three weeks trip to California.

H. H. Watson, superintendent of Construction for the Byllesby Engineering and Manufacturing Corporation at the San Diego Consolidated Gas & Electric Company property, attended the recent Chicago convention of Byllesby construction superintendents.

Ray Robinson, of the Robinson Sales Company, Seattle, recently returned from a trip to California, with an enthusiastic report on the doings of the Electrical Development League of San Francisco.

Miss Bernice Lowen, home economist of the Edison Electric Appliance Company, Ontario, Calif., presided over a cooking school held under the auspices of the Spokane Chronicle in Spokane a short time ago. The school was attended by over 6,000 women and was regarded as entirely successful. During the following week Miss Lowen conducted a school in the Electric Shop of The Washington Water Power Company.

Harold S. Smith, formerly with the Pacific States Electric Company, Fresno, Calif., has been manager of the Seattle store of the newly incorporated firm of R. R. Poppleton, Inc. V. E. Weber has been named manager of the Portland branch.

T. W. Carlson has been appointed resident representative of the Benjamin Electric Manufacturing Company, Chicago, for the Northwest with offices at 422 L. C. Smith Building, Seattle, succeeding T. F. McDonough. Mr. McDonough has been transferred to Los Angeles where, with G. J. Thom, who is working on radio and specialties, he has headquarters at 600 I. W. Hellman Building and handles Benjamin business in southern California. H. J. Mayo, who formerly represented the Benjamin Electric Manufacturing Company in southern California, now is representing Listenwaller & Gough, Inc., in that territory.

Robert Miller, manager of the General Electric Company's Denver office, was in Salt Lake City a short while ago.

B. C. J. Wheatlake, A. E. Anderson and G. N. Robinson, of the Salt Lake City offices of the General Electric Company, attended the recent convention of the Wyoming Utility Association at Cheyenne.

D. C. Green, vice-president and general manager of the Utah Power & Light Company, returned to Salt Lake City during the early part of November, after a two weeks trip to the New York offices of the Electric Bond & Share Company.

C. W. Koerner, formerly city manager of Pasadena, Calif., has returned from a European trip of several months duration. Mr. Koerner was one of the delegates from the United States to the annual Congress of Cities held in Paris in September.

L. R. Brown, manager transformer sales division, General Electric Company, Pittsfield; Leeland Granger, superintendent distribution and transmission, Detroit Edison Company, and E. M. Ellis and J. O. Case of the Los Angeles offices of the General Electric Company, were visitors in San Diego lately.

John Cooper, Mountain division representative, attended the recent conference of the National League Council held in connection with the semi-annual meeting of the Electrical Supply Jobbers' Association in Buffalo, N. Y.

Guy W. Talbot, president of the Pacific Power & Light Company and Northwestern Electric Company, Portland, has returned from Chicago where he attended N.E.L.A. committee meetings. He also visited New York on business for his companies.

Charles Wright, formerly with the Economy Fuse Company, Seattle, in the Spokane territory, is now district representative for that firm, with offices in the Henry Building, Seattle.

E. O. Shreve, manager of the General Electric Company's San Francisco branch, was a recent visitor in Salt Lake City, on his return trip to San Francisco after a visit to his company's works at Schenectady.

R. P. Crippen, formerly in charge of the relay work of the Great Western Power Company of California has resigned to accept a position with the Carolina Power & Light Company at Raleigh, N. C. He will be associated with J. H. Paget who is superintendent of power for the Carolina company. Mr. Paget was formerly with the Great Western Power Company as meter and relay engineer.

Thomas Traynor has been made retail relations manager for the Pacific States Electric Company with headquarters in Oakland. Mr. Traynor was formerly secretary, Alameda County Radio Dealers' Association; secretary, San Francisco Retail Radio Dealers' Association, and retail field representative, Pacific Radio Trades Association.

E. R. Stauffacher, protection engineer, and L. L. Dyer, superintendent of substation operation, Southern California Edison Company, spent several days with the San Diego Consolidated Gas and Electric Company in December.

L. J. O'Brien, formerly with the Great Western Power Company of California, San Francisco, has recently been appointed the representative of the Malleable Iron Range Company of Beaver Dam, Wis. Mr. O'Brien has jurisdiction over California, Nevada, and Western Arizona for the Monarch electric range manufactured by that company.

Lewis A. McArthur, vice-president and general manager, Pacific Power & Light Company, Portland, lately visited Spokane in order to confer with Lewis A. Lewis, president of the Northwest Electric Light and Power Association, on general committee work.

Walter F. Price, formerly with the Arrow Electric Company, San Francisco, has resigned to become affiliated with the Fred T. Wood Company, Inc., realtors of Oakland, Calif. Mr. Price was executive secretary of the California Electragists prior to his connection with the Arrow Electric Company.

William Trudgian, of the Westinghouse Electric & Manufacturing Company in Denver, was made the recipient of the "C" medal awarded annually to the alumnus of the University of Colorado who has contributed materially to the athletic welfare of the institution at the recent Homecoming Day exercises at the university.

them until 1895 when he joined the Edison Lamp Works of the General Electric Company at Harrison, N. J. In 1910 he went to South America to undertake special lamp work, and early in February, 1911, he became connected with the British Thomson-Houston Company, England, where he later became general manager of the lamp and wiring supplies department. In November, 1923, he returned to the Edison Lamp Works where until the time of his death he was engaged on special duties. He was a pioneer as a commercial engineer.

Franklin I. Fuller, first vice-president, Portland Electric Power Company, Portland, died at his home Dec. 16, 1925, of acute indigestion, after an ill-



FRANKLIN I. FULLER

ness of only two days, at the age of sixty-seven. He was born in Providence, R. I., May 29, 1858. After studying civil engineering in school, Mr. Fuller applied this profession in the office of the city engineer of Providence for some years. Later he took up railroad work and was engaged in location and construction work in New York and Wisconsin. After arriving in Oregon, he became connected with the North Pacific Terminal Company and later held the position of assistant manager of the Oregon Iron & Steel Company, Oswego, Ore. His association with the street railways of Portland dates from 1892 when he became connected with the Portland Cable Railway Company, one of the original lines in the city, of which he soon became manager. He held this position through numerous mergers and consolidations until 1906 when all the street railway lines and power and light interests in the city were merged into the Portland Railway Light & Power Company. At this time Mr. Fuller was made vice-president in charge of transportation. His greatest engineering achievement was the construction, against the advice of other railroad engineers, of the Portland Heights line, now remaining one of the most scenic street railways in the country.

O. C. Miller, underground electrical engineer, Los Angeles Gas and Electric Corporation, died suddenly in that city Dec. 11.

L. H. Griffith, credited with being the builder of the first Seattle-Tacoma electric line in 1891, and connected with other power and transportation activities, died in Seattle Dec. 14.

Obituary

F. W. Willcox, a well-known figure in the electrical industry, died in New York Dec. 1. He began his electrical career with the Thomson-Houston Electric Company, Atlanta, remaining with

TRADE NOTES

General Electric Company, Schenectady, has issued bulletin No. GEA-178, entitled "Instrument Transformers", a 52-page, paper-bound booklet devoted to the theory and engineering characteristics of transformers used to facilitate the measurement of electrical quantities.

Pittsburgh Transformer Company, Pittsburgh, has issued bulletin No. 2049 describing the developments in the transformer art in recent years of the Pittsburgh polyphase transformer structure, the Pittsburgh film-type radiator and the expansion tank for transformers. The bulletin is illustrated with diagrams and photographs.

The Wheeler Reflector Company, Boston, has issued a new catalog describing and listing its different types of industrial fixtures. The catalogs are being distributed by the H. B. Squires Company, San Francisco, representatives for the company.

Texas Creosoting Company, Orange, Texas, recently has brought out an interesting booklet entitled, "Enemies of Your Pole Lines," for the light and power and telephone industries. The booklet describes the qualities of properly creosoting Southern yellow pine poles that make them resistant to in-roads from decay, termites and fire.

W. P. Fuller & Company, San Francisco, has issued Industrial Bulletin No. 4 on the subject of wood preservatives. This bulletin is one of a series which the company is publishing with a view to creating a reference work on the subject of industrial paints.

The Westinghouse Electric & Manufacturing Company, East Pittsburgh, is offering an elliptical angle reflector, in which the bowl of the reflector is flattened into the form of an ellipse. This reflector is so designed as to build up the illumination between units.

Allis-Chalmers Manufacturing Company, Milwaukee, Wis., has opened a branch sales office at Houston, Texas, in charge of R. I. Moore, who previously was connected with the firm's Dallas office. Temporary quarters are being occupied at 231 Rodgers Building, but after the first of the year the office will be located permanently at 1108 Post Dispatch Building.

Charles Engelhard, Inc., New York City, has developed a mercury contact switch which it is claimed is unfailing in its operation. It is claimed further that with this switch there can be no loose connections, and dirty contacts and corrosion are impossible.

Bernard Rowntree, Los Angeles, has been appointed sales representative in California, Oregon and Washington for the Magicoal electric fires, manufactured by Berry's Electric, Ltd., New York City; for electric coffee cutters, products of S. M. Nevius, Inc., Hornell, N. Y., and synthetic ivory switch plates put out by the Ivori-Craft, Inc., Newark, N. J.

Lincoln Electric Company, Cleveland, has issued a new catalog dealing with welding machines and supplies, including cables, glass, shields, welding electrode, aprons, gloves, brushes, elec-

The Servel Corporation, New York, has enlarged its floor space by taking the entire seventeenth floor in addition to the eighteenth floor it now occupies in the Vanderbilt Avenue Building, New York City.

Hanson Wholesale Electric Company has been appointed agent for the distribution of the Savage washer and dryer in the Intermountain country, with offices in Denver, Cheyenne, Salt Lake City, and Brigham City, Utah.

Western Sales & Equipment Company is a newly established manufacturers' agent for the Hamilton Beach Company, Conlon washer, Robbins & Myers, Reutenber Electric Company and several other accounts. The company will be located at 503 Fourteenth Street, Denver. W. I. Burt, W. J. Laufenburg, W. H. Orr and W. Moore are members of the firm.

Pacific Electric Manufacturing Company, San Francisco, has issued bulletin No. 504, describing and illustrating high-tension switches and giving details of the Pacific fuse and support type 522 and the type 500. In bulletin 9,000, issued recently, complete descriptions are given of the Pacific multi-break oil circuit breakers.

Delta-Star Electric Company, Chicago, in its Dec. 15 issue of the Delta Star Monthly, gives an interesting description of a standard outdoor construction for voltage up to 132 kv. Copies will be sent upon request.

Harvey Hubbell, Inc., Bridgeport, Conn., has announced a new line of square handle toggle switches, which are equipped with a new simplified "lock and release" mechanism. The handle of the switch operates directly on the "lock and release" movement instead of through a secondary member, resulting in a smooth and positive action.



Some electrical men try for "birdies" on the golf course, but L. M. Cargo, Rocky Mountain district manager of the Westinghouse Electric & Manufacturing Company, gets birdies another way. A great nature lover, Mr. Cargo has trained a flock of pigeons to visit him daily in his office on the top floor of the Gas & Electric Building in Denver. Winter and summer these feathered visitors come to be fed at the edge of his desk.

Edwin L. Wiegand Company, Pittsburgh, has issued bulletin C-100 which covers its complete line of Chromalox products and is now ready for distribution. This company is bringing out a new refractory heater which will be termed a space heater, differentiating it from the company's standard product known as strip heaters in that this new unit will be made in 2-ft. lengths only, designed for 500 watts in the following voltages, 110, 220 and 250. It is a somewhat lighter heater to meet the demand of open-air space heating. The company is represented on the Pacific Coast by the Electric Materials Company, 589 Howard Street, San Francisco.

Taylor Instrument Companies, Rochester, has issued a new 56-page catalog No. 4,000, which fully illustrates and describes its Tyco's pyrometers. Tyco's recording-pyrometer charts and price lists also are included in the bulletin.

Pass & Seymour, Inc., Syracuse, has placed on the market a new bracket type porcelain receptacle for use as a side wall bracket with flush boxes. It is made in two styles, the P & S 844 with porcelain ring for ball lamps and the P & S 845 with porcelain shade holder for bracket glassware. Both are fitted with rugged pull chain, and are suggested for use in bathrooms, barger shops, hospitals, kitchens, etc.

Hamilton-Beach Manufacturing Company, Racine, Wis., has appointed W. S. Etheridge general sales manager for the company. Mr. Etheridge formerly was connected with the Edison Electric Appliance Company, Chicago, as assistant sales manager.

United Electric Company, Canton, Ohio, has made new improvements in both its model 5 Ohio cleaner and its new Gem cleaner. The Ohio cleaner now is made with a larger bag and a new type name plate, while the Gem also has many new features.

Sangamo Electric Company, Springfield, Ill., has issued bulletin No. 70, giving instructions on the Sangamo type H single and polyphase watt-hour meters.

Electric Service Supplies Company, Philadelphia, has issued bulletin No. 216 on floodlighting. The booklet is illustrated with photographs of the latest type of floodlighting equipment, as well as views of various applications. Charts and diagrams furnishing specific data also are given.

Electrical Engineers Equipment Company, Chicago, has issued recently bulletin No. 112, containing 143 pages of detailed data on indoor switching equipment.

Gillinder Bros. Glass Company has designated the Wesco company in Denver as manufacturers' agent for its products in the Mountain region.

Pittsburgh Transformer Company, Pittsburgh, has issued bulletin 2050 covering Pittsburgh polyphase transformers, with a complete discussion on the importance of low exciting current and its value in the operation of transformers. It also draws attention to other points of saving through the use of Pittsburgh transformers.

Edison Electric Appliance Company, Inc., Los Angeles, is established at 327 West Second Street, where it is occupying ground floor space, which is more accessible to the public. The concern formerly was located at 505 Equitable Building.

Journal of Electricity

Devoted to the Economic Production and Commercial Application of Electricity
IN THE ELEVEN WESTERN STATES

Socold

ELECTRIC REFRIGERATION

—an extraordinary plan for
Jobbers and Dealers !

Never before have electrical jobbers and dealers been offered such an opportunity as the new and complete line of Socold Electric Refrigerators. The Socold Jobber-Dealer Co-operative Selling Plan is a carefully conceived plan which opens new sales and profits to progressive dealers and jobbers. In 1925 our entire output was taken by Pettingell-Andrews Co. of Boston, our Eastern Distributors, and Robertson Cataract Co. of Buffalo.

Central Stations, too, can profit by backing such a dependable, low-cost load builder.

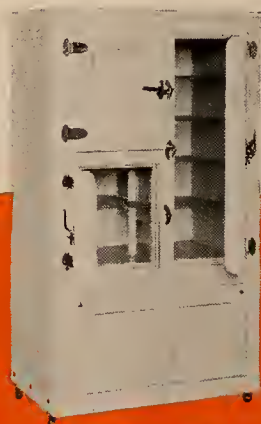
Jobbers and Dealers—get the details of the Socold Plan NOW. Wide-awake jobbers can get some of the valuable territory still open.

Standard House box complete, ready to install, including machinery, etc. Golden Oak or White Enamel Finish.



Sealed!

The patented seal is an exclusive feature of the Socold. It positively prevents leakage of gases.



Large Size, three-door type. Golden Oak or White Enamel Finish.

Four-door size. Golden Oak or White Enamel Finish.



Guarantee

The Socold is guaranteed against defects in material or workmanship for one year after installation.

The R. H. Booth Sales Co.

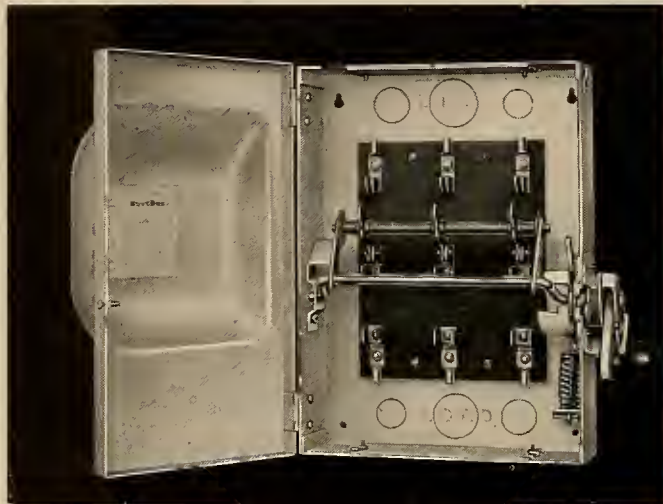
108 Massachusetts Ave., Boston, Mass.

BULL DOG

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SWITCHBOARDS-PANELBOARDS-CABINETS

For SERVICE with SAFETY



A few "BULL DOG" Features—

A switch superior in design and workmanship.

Positive QUICK MAKE which insures full contact and prevents accidental closing of the switch. QUICK BREAK to reduce the arc and insure positive opening of the switch.

Constructed so that qualified electricians may have access to switch in any position.

Ample room within the cabinet, plenty of wiring space.

LUMINIZED finish—luminous in the dark, resists rust, acids and alkalies, presents a clean appearance and are easily grounded.

Manufactured by
MUTUAL ELECTRIC & MACHINE COMPANY
 DETROIT, MICHIGAN

Complete Stocks Carried by

BAKER-JOSLYN COMPANY

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ELECTRICAL EQUIPMENT AND CONSTRUCTION MATERIALS

SAN FRANCISCO

LOS ANGELES



Journal of Electricity

With which is consolidated the "Electrical Journal" and the "Journal of Electricity, Power & Gas."
Devoted to the Economic Production and Commercial Application of Electricity
IN THE ELEVEN WESTERN STATES

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NUMBER 2

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A New Era in Merchandising

IN line with a policy devoted to the betterment of the industry in all of its many phases, a new and stronger policy with regard to the activity of the Better Merchandising section of the Journal of Electricity is announced in this issue.

Feeling that the year 1926 can be made an epoch of commercial development in the electrical industry by the application of those principles which have given other American industries such a leading position in the commercial world, the Better Merchandising section will be edited with a view to pointing the way to that development.

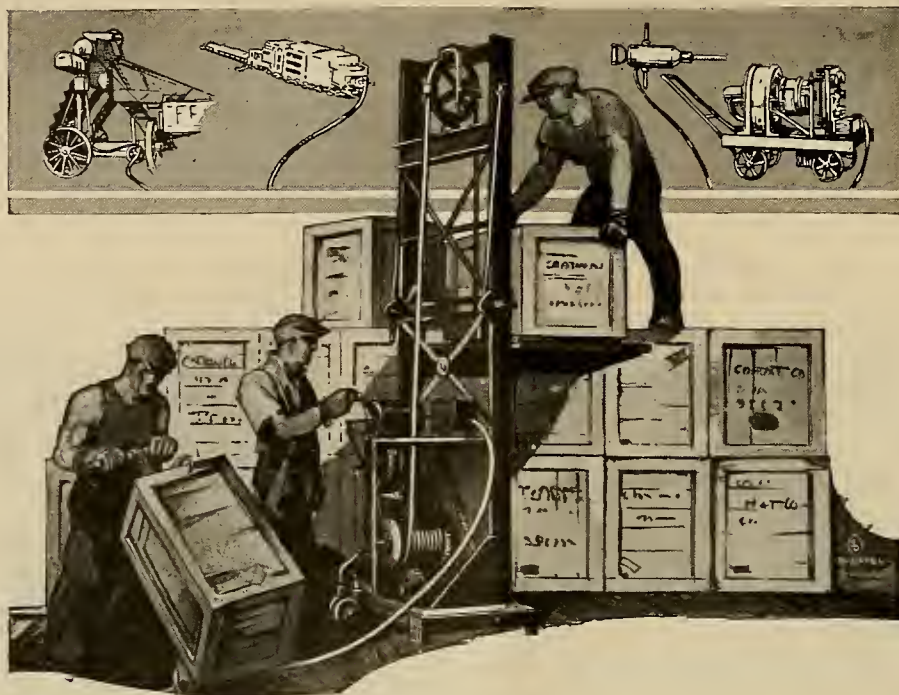
There can be no doubt about the value of higher-powered merchandising, more efficient and more able selling. To the central station company it means load-building. To the contractor it means a demand for more wiring to care for the increased uses to which electricity may be put. And to the merchandiser, with the manufacturer, the jobber and the supply sources backing him up, the program means better and more business along sounder lines.

Many central-station companies themselves are about to launch intensive merchandising activities. Many non-electrical outlets are going to push electrical merchandise as never before. But for whoever applies scientific and sensible sales methods the rewards will be ample.

And it shall be the purpose of the Better Merchandising section of this magazine to concentrate and digest these selling principles so that all who read may learn, and, learning, apply them with profit to their own merchandising activities.

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Electrical Merchandising
Chemical and Metallurgical Engineering
American Machinist
Electrical World
Electric Railway Journal
Engineering and Mining Journal-Press
Bus Transportation
Coal Age
Radio Retailing
Power



Go After This Business

Industrial plants are heavy buyers of electrical supplies. They yield a steady income to the electrical dealer who can hold their business. One sure way to keep your industrial customers satisfied is for you to recommend and install only equipment that has shown its ability to stand up under the hardest conditions of service.

DURACORD

Reg. U. S. Pat. Off.

Has proved its strength in industrial work. It has a tough woven cover which resists jerks and pulls and prevents the conductors stretching and breaking. This cover is also impregnated to resist water, oil and abrasion—the three evils which most frequently cause the breakdown of portable cord in industrial plants.

DURACORD is made in all standard sizes, ranging from the largest size required for a magnetic crane to the smaller sizes used on extension lamps. Your jobber can supply you with DURACORD to fill every cord requirement of your industrial customers.

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 53 Fourth St.

EDITORIAL

New Radio Developments as They Affect the Power Company

INVESTIGATING complaints and correcting faults where they are directly traceable to the condition of power lines is an important and essential duty of the central station in connection with the development of radio. But aside from this, what should be the attitude of the power companies toward the radio industry? Developments of the past few months have brought this question forcibly to the attention of central-station executives. With the perfection of a.c. current supply, radio sets have been placed in the class of socket appliances and as such represent an important source of revenue. Radio engineers state that an ordinary battery charger represents a connected load of 100 watts, while the more recently developed amplifiers have capacities as high as 250 watts. On the basis of only average use by the radio operator it is conceivable that a battery charger will use upwards of 50 kw-hr. per year and a power amplifier 400 kw-hr.

As a matter of fact, a study of battery-chargers connected to the lines of one Pacific Coast power company revealed the fact that the additional revenue derived from radio during 1925 was approximately \$200,000 and that the estimated revenue for 1926 will approximate \$400,000. This also takes into consideration the revenue from kilowatt-hours used for lighting during the additional hours that a radio set is in operation in the evening.

In the face of these facts it would seem that power companies must give some consideration to the subject of radio and their attitude toward it. Whether or not central-station commercial departments will be justified in merchandising complete radio sets, battery chargers or the newly perfected A and B battery eliminators will be a problem for each company to decide for itself. Central stations which have undertaken the merchandising of radio have met with varying degrees of success.

It has been suggested that power companies might own and operate broadcasting stations, but this step is not to be recommended because the radio industry is looking for the support of broadcasting to outside sources—among others, to those who derive no direct benefit from the sale of radio apparatus but who appreciate the advertising value of broadcasting.

However, the radio industry is justified in looking to the power companies for some measure of co-operation in return for the benefits which are being derived from the development of radio. Just what direction this co-operation is to take is a matter for conjecture. It might well take the form of co-operation with the local radio trade association. The

radio trade would welcome such a step. Also more money might be spent on "trouble shooting" crews to investigate radio complaints. The latter suggestion has many virtues.

Whatever the attitude of any individual power company on the subject, the fact remains that so long as the present trend in radio keeps up, the radio operator must look to the central station for energy to operate his set, either through a battery-charger or a direct a.c. current supply.

Installment Selling Is Boon to Electrical Industry

MANY people and organizations, even our own United States Chamber of Commerce, are giving serious thought to the phenomenal expansion of installment selling. Ten years ago the so-called deferred-payment plan was confined chiefly to real estate, furniture, pianos and expensive sets of books. Today almost nothing escapes. It has been estimated that the aggregate amount of installment credit now in force in the United States is in the neighborhood of \$3,000,000,000. While this figure is admittedly a guess it is probably a close approximation of the actual truth.

Economists, investigators and other learned folk are arguing vociferously both for and against this method of selling. A prominent New York banker recently has come out unequivocally as opposed to installment selling, while manufacturers, merchants and other bankers are equally vigorous in their statements that deferred payments and installment selling are the life of modern business. Many banks, especially in the West, are "selling \$1,000" on installments as an interesting means of using a deferred-payment plan of inducing thrift, while those opposed to the idea make the claim that installment purchasing induces extravagance.

It is difficult for the dispassionate observer to take sides in a question such as this when so-called experts seem to disagree so radically. Installment purchases are used vigorously by every commercial branch of the electrical industry in furthering the sale of electrical appliances particularly, and they are doing it with undoubted success both for the buyer and the seller. It would appear to be fairly obvious that the installment or deferred-payment plan as marking a new era in merchandising is a tool of undoubted excellence and efficiency when it is administered wisely and applied to constructive purchasing. Like any other tool it can be misapplied and become destructive when it is used to induce extravagance and promote the purchase of articles clearly in the luxury class. It is not that

installment or deferred-payment merchandising is unsound. It may prove to be unsound when it urges the purchase of luxuries and other extravagances beyond the means and unjustified by the income of the installment purchaser. To be able to purchase such things as electric household appliances by the installment plan confers a real blessing upon the householder because of the labor-saving, convenience and economy of the articles purchased. As applied to the purchase of an expensive diamond ring, for instance, the opposite would appear to be the case. There are many people, unfortunately, who are so constituted that, in the vernacular of the street, they cannot save a cent, but put them in debt in a constructive way and they will work themselves out, provided that it is not overdone.

On the whole we believe that installment-plan purchases have done an infinitely greater amount of good than harm.

Taking Tips from the Automobile Salesman

"FOR instance," said a noted executive at a recent street railway men's convention, "street cars had eight-wheel brakes for years, and nobody even thought anything about it. But when automobiles began to be equipped with four-wheel brakes, it was the leading topic of conversation everywhere." He went on to show that street railways might learn much from the automobile industry in the way of selling their service to the public.

The street railway is not the only one who may learn from the automobile industry something in the way of sales promotion. There is much that the electrical merchandiser may learn from this same source. The subject of sales is one that the electrical dealer has only just begun to realize as of prime importance. The pioneer job of wiring all the homes of the community seemed more important than selling appliances to be used on those outlets installed, at least until recently. As a result, perhaps salesmanship has not been developed in the electrical industry to the high pitch which necessity demanded in the automobile industry.

Many of these things were discussed in a recent commercial meeting, and many ideas, used for some time by automobile dealers, have been proposed for modification and use by electrical merchandisers.

One proposal made was that electrical interests work out a standard scale of repair job prices. The motorist with a valve-grinding job or loose connecting-rod bearings knows by reference to a standard price chart just about what the repair job will cost him. Why can not the washing-machine owner refer to a price scale to see what it will cost her for a complete re-oiling and adjusting, or for the replacement of worn wringer rollers. The idea is worth thought.

Another plan suggested was a maintenance-insurance policy idea for major appliances. It would work as follows: After the guarantee period for gratis repair and replacement, a definite yearly service charge of, say \$5, would entitle the appliance owner to regular inspection of the apparatus and free repair and replacement in case of breakdown.

Many appliance owners would welcome such a policy for mere relief from worry and for the privilege of having a competent mechanic oil up the machinery when it was needed and see that everything was in perfect adjustment.

A courteous gesture that will reflect in good will and can be made a definite sales-builder for return orders from the same customers is a plan that has been suggested for incorporation in the appliance committee's yearly program. It, too, is an adaptation of an automobile sales policy. A postcard is sent to the purchaser of any electrical appliance just thirty days or so before the expiration of the guarantee on the appliance. Its purpose is ostensibly to remind the purchaser that a year ago the appliance was purchased and that the guarantee period is about to expire. If the appliance has been found defective in any way, the customer is urged to bring it in for repair before the expiration date. The appliance, if it has reposed on a shelf for some time, immediately is trotted out and used at peak load to force it to bring forth any possible defect before the guarantee runs out. The customer gets into the habit of using it. The appliance is put on the line where it is meant to be. And the dealer who sold it earns a feeling from the customer that here is a merchant who is interested in seeing that his products give service. The postcard acts as a silent salesman for other appliances from the store.

No doubt there are many more sales stunts which may be borrowed from the automobile man. There are many which can be taken from other lines of sales activity. And since, basically, all sales are built upon the same cardinal principles of service, they are the property of all who may wish to use them.

1926 Will Be Banner Electric Refrigeration Year

THE year 1925 will stand out in the commercial annals of the electric light and power industry as a banner year because it marked the definite arousing of interest in the commercial possibilities of domestic electric refrigeration. Today the industry stands upon the portal of a year of golden promise in the development of this load.

Those central stations which have not yet studied and profited by the work done in connection with domestic refrigeration during 1925 are overlooking a fruitful field. Such commercial departments as have not included the electric refrigerator among the appliances which will be merchandised during 1926 are shortsighted. To their managers we recommend the immediate consideration of the report of the electric refrigeration committee of the N.E.L.A. If they do not then become enthused there is no hope for them.

To the central stations who are planning actively to merchandise electric refrigerators we also recommend the same report and more especially the methods suggested. These are:

1. High-grade salesmen specializing on refrigeration alone.
2. Carefully selected prospect lists covered by

salesmen at regular intervals and followed up by mail advertising.

3. Newspaper advertising emphasizing the importance of proper refrigeration and special advantages of electric refrigeration.

4. Displays in electric shops, home exhibitions, etc.

5. Specially trained service men on call at all times.

6. Regular system of inspection until public becomes educated to the care of refrigerators.

The extent to which central stations will profit from this field during the year will be directly proportional to the amount of effort expended. Nineteen twenty-six will be a banner refrigerator year.

Red Seal Promises Achievement of Electrical Home Idea

PREPARATIONS under way for placing the Red Seal plan in operation in California have reached the point where it is believed that the elaborately built organization will be functioning almost entirely by the end of this month. It has taken a great deal of thought and study, particularly in working out the details, to organize so large a state as California and provide a *modus operandi* that would be as free from red tape as possible and yet one that would be effective and comply in every respect with the fundamental laws of the Red Seal plan as promulgated by the Society for Electrical Development.

In studying the principles involved it should be pointed out that, while on the surface the Red Seal plan is a method of promoting adequate housewiring, this alone is not the ultimate goal to be achieved. It is a first step and only a first step in the achievement of the ultimate ambition of every real, true-blue member of the electrical fraternity, and that is the complete electrical home.

In the final analysis the success of the Red Seal plan will depend upon the manufacturers, the jobbers and the retailers. The details of the administration of the plan in California provide that lists of Red Seal home-builders and owners shall be disseminated among subscribers to the Bureau funds. Herein lies the real opportunity for those engaged in the manufacture and sale of electrical appliances, particularly the larger current-consuming devices. The degree to which this branch of the industry follows up the opportunity afforded by so splendid a list of prospects will measure finally the ultimate success of the Red Seal plan. The 100-per-cent electrical home should be the goal of every member of the industry. The Red Seal plan offers an ideal opportunity for the accomplishment of this end.

Henry Ford Speaks on Municipal Ownership

HENRY FORD, provider of recreation, transportation and grief to the multitude, whether it be for picnicking on the shore of Puget Sound, crossing America or hunting lions in Africa with a bow and arrow, has some definite ideas on why municipal plants fail. In a recent copy of his *Dearborn Independent* he says:

"I read in the papers that the municipal owner-

ship cry is subsiding in the U.S. The probable reason is that, good as it is in theory, it does not work in practice.

"Men who are competent to run great enterprises are not in politics and if they are hired to run municipal utilities they are too much hindered by politics.

"One very bad feature of municipal ownership is that the newspapers seldom tell the people the full truth about it. One good feature of private operation is that newspapers jump on a corporation at the least deviation from service.

"But, whether privately or publicly operated, public utilities should be strictly amenable to general public control. Every franchise should stipulate that. And in municipal ownership taxpayers should be informed how much of a deficit they are making up."

As Mr. Ford says, all public utilities should be subject to public control. But when government enters business there ceases to be any independent critic which can supervise and control its operations. In the case of municipal utilities railroad or utility commission supervision might be recommended to everyone but the municipal ownership adherents themselves. They know what a poor showing they would make in comparison with the privately operated utilities.

DISCUSSION

Corrects Impression That Power Company Is Co-licensee with Irrigation District

To the Editor:

Sir—In the Dec. 15 issue of the Journal there appeared an item to the effect that Pacific Gas and Electric Company is made co-licensee with Nevada Irrigation District in a license recently issued by the Federal Power Commission.

It is true that the original draft of the license in question made this company a co-licensee but it was subsequently modified and as finally issued, this company was not a party thereto.

Under our agreement with the Nevada Irrigation District this company will take delivery of water from the District at Spaulding and route same through our conduits and power houses for the generation of power, paying to the District an agreed upon price for such usage.

I give you the above information because the inference to be drawn from reading the article in question is that the license might have been accepted in its original form.

Yours very truly,

P. M. DOWNING,

Vice-president in Charge of Electric Construction and Operation, Pacific Gas and Electric Company.

San Francisco, Calif.,

Dec. 21, 1925.



MYSTIC LAKE, a glacial formation in the Rockies of southern Montana, now furnishes 12,500 kw. to Montana industries.

Rocky Mountain Lake Tapped Beneath Surface in Power Development

AN eastward trend in the growth of the business of The Montana Power Company and an increasing demand for better service caused that company to develop its Mystic Lake power site. This particular development was selected as being the most logical after a survey and study of other possible sites in the eastern part of the state had been made. Buffalo Rapids near Miles City, Mont., and a site on the Big Horn River some 60 miles southeast of Hardin, Mont., gave way to the Mystic development.

Mystic Lake is the largest of a string of six lakes on the west Rosebud tributary to the Stillwater River. It is about 45 miles southwest of Columbus, Mont., the nearest railroad point. Preliminary investigations of this project were made as early as 1913 by A. C. Pratt, electrical engineer, and F. W. Bird, civil engineer, of the company's engineering department. The maximum depth of the lake is unknown, but it has been sounded to a depth of 183 ft.

The natural outlet of the lake is over a massive dyke of quartzite granite. This mass of rock apparently was too much for the glacial drift that at one time gouged out the depression which Mystic Lake now fills, hence the natural barrier. The elevation of the crest of this natural dam is about 7,650. From this point there is a precipitous fall of some 300 ft. At the highest and extreme southern end of this drainage basin is the "Grasshopper Glacier," which heads the principal tributary to the lake.

This glacier is of itself peculiar and interesting. It gets its name from the fact that untold numbers of grasshoppers, butterflies and other insects are imbedded in it. Authorities disagree over the probable origin of these insects. Some state that they are prehistoric while others point out that the stratified nature of the insect deposits would tend to show that these deposits are annual and caused by the downdraft of air over the glacier which would bring down passing swarms of the insects each season.

The total drainage area which supplies Mystic Lake is about 50 sq. miles and the over-all average discharge is 165 sec.-ft. This discharge will vary from a normal minimum of some 40 sec.-ft. in the

THE Mystic Lake power development of The Montana Power Company marks a step in the eastward growth of the load of that company. The project utilizes a natural storage basin formed ages ago by glacial action. Unique in the annals of Pacific Coast power development is the driving of a 1,000-ft. tunnel through a solid-rock knoll and into a lake 41 ft. beneath its surface. The interesting features involved are described in this article.

cold winter months of December, January and February to a normal maximum of perhaps 900 sec.-ft. during the months of June and July. Some 45 in. of precipitation is necessary in a year's time to produce the 165 sec.-ft. average run-off. No increase over natural storage resources is contemplated for the present. However, there are possible dam locations whereby the greater part of the total precipitation may be stored in the several lakes and released as desired instead of running to waste as it now does.

With these engineering features in mind, the project was developed to utilize a maximum discharge from the area of 150 sec.-ft.

Mystic Lake itself is about $1\frac{3}{4}$ miles long and $\frac{3}{8}$ mile wide. Its surface elevation is 7,650 and its surface area about 347 acres. With the present construction the maximum storage available is 12,700 acre-ft. Within the next two years it is contemplated to increase this figure to 20,500 acre-ft. by the construction of an arch dam across the present outlet that will raise the water level some 20 ft.

General

Before any work could be done on the project itself it was necessary to construct 15 miles of private highway from the nearest county highway point at El. 3,900 to the power house and camp site at El. 6,550. This road was laid out with maximum grades of 5 per cent, as all material entering into the construction of the project had to be hauled over it on trucks and during all kinds of weather. The cost of the highway complete with necessary surfacing, fences, gates and cattle runs was nearly \$75,000. Construction work was begun on the road in the fall of 1921 and was completed in May, 1923.

During the road construction period the engineering work in connection with the power development also was carried forward. As soon as the road was completed the contract was let for the construction of the pressure pipe line grades from El. 6,550 to El. 7,560. This grade is 2,700 ft. long and was designed to carry the pressure pipe and a construction tramway of 3-ft. gage as well. From the head of this rise a bench 9,000 ft. long, 12 ft. wide and on a grade of 0.4 per cent was cut from almost solid rock to provide support for the wood-stave pipe line and the 3-ft. gage track from the head of drop to

the lower tunnel portal. This work was started early, supplies and equipment being transported on pack animals. Nearly 100,000 cu. yd. of material were removed in the making of this bench.

Following the completion of the road and the pressure-line grade, a 50-hp. gasoline hoist was brought in, dismantled and hauled to the top of the incline partly by pack animals and partly by block and tackle. There the hoist was reassembled and the work of constructing the tramway begun from the bottom. At the same time a pole line was erected from the power house site to the top of the incline. In the summer of 1923, a transmission line was built from the Red Lodge and Bear Creek coal mining districts into the camp to supply the power necessary for construction. This line came in at 50 kv. to a transformer station at the power house site. A 125-hp. electric hoist then replaced the gasoline hoist in serving the incline tramway. All of the material for the upper end of the job was taken up over this incline and then transported along the upper level by means of a Fordson tractor mounted upon a special locomotive frame adapting it to use on the 3-ft. gage tramway line. It was not long before this means of transportation caught up to and replaced the pack trains which had been in use transporting explosives and steel to the benching crews.

From the description so far, it will be apparent that the hydraulic development was primarily a "one-ended" job. All work had to start at the power house end and progress through to the actual tapping of the lake. This necessitated careful planning and careful handling to maintain the proper sequence without any interference.

Tunnel

At the upper end of the flow-line grade a tunnel 1,000 ft. long and 6 x 7 ft. in cross-section was constructed to pierce a rock knoll and tap the lake 41 ft. below the surface, at El. 7,608.75. It was realized early that the tunnel presented the largest single item of the entire project, and probably would take as much time to construct as all of the balance of the work. Therefore, early in 1923 the contractors hauled to the lower portal site by means of block and tackle two small fuel oil compressors. An operating camp was established at this point, too, and all supplies for the operation were carried in by pack train from the "rail head" on the tramway back where benching operations were progressing. Valuation construction time thus was saved.

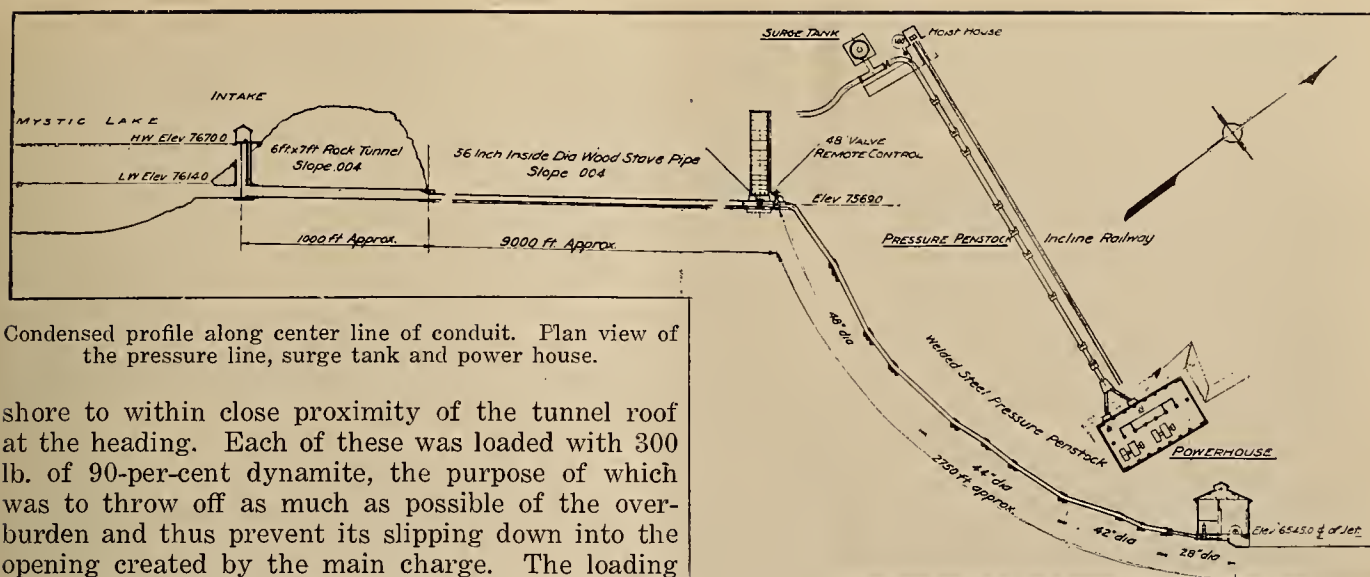
The quartzite granite rock through which the tunnel was driven was extremely hard and dense, so hard that 16 lb. of 80 per cent gelatin explosive per cubic yard of excavated material was necessary. This is about twice the amount normally required for tunnel work. Two shifts were used and a progress of about 6 ft. per shift was maintained. No timbering of any kind was required until a point about 930 ft. in from the portal was reached. At this point the tunnel struck a large vertical fault plane and water was encountered to the extent of nearly 15 sec.-ft. This unexpected event caused a

temporary cessation of tunnel construction and a slight revision of plans.

After a thorough study of the geological conditions of the ground adjacent to the fault it was decided to go back about 65 ft. in the tunnel and start a branch tunnel heading, bearing some 40 deg. to the left of the original which had run into the water flow. Accordingly a pilot tunnel 3 x 7 ft. in section was branched from the main tunnel to a point some 22 ft. from the main tunnel and thence parallel to the main tunnel. This pilot tunnel was driven successfully to a point within 40 ft. of the lake bed and practically no water was encountered. The original tunnel apparently had relieved most of the water pressure in the fault and served to drain the fault sufficiently to permit work being carried to a successful conclusion in the branch tunnel. As soon as it was apparent that the pilot tunnel was successful it was enlarged to normal dimensions of 6 x 7 ft. in section.

The very nature of this feature of the project seemed to preclude the possibility of following definite, predetermined plans. Hence it was necessary to have frequent engineering conferences to decide upon the proper course of procedure. As the branch tunnel approached the point where original plans had called for the location of the gate control shaft, two possible methods of attack had to be chosen between. One of these was to raise the shaft from the tunnel level to the surface above the shore line of the lake. Then to make a surface cut from the shaft to the lake shore and gradually deepen this cut, draining the lake through it as it was lowered. The second of the possible plans called for an attempt to advance the original tunnel through the fault in the face of the 15 sec.-ft. flow of water and extend it to a point as close as possible to the lake bed at that point. It was believed that no more than the 15 sec.-ft. of water would be encountered at least until the bed of the lake was approached closely. When the tunnel was driven as far as possible this latter plan considered the expedient of blasting the final opening into the lake at the tunnel El. 7,608.75, and allowing the lake to be drawn down through the resulting opening. At the same time this plan would permit the sinking of the shaft from the surface where the muck could be handled by a derrick which had been installed over the workings instead of having to be handled through the 1,000-ft. tunnel. This latter plan finally was adopted and the original tunnel advanced to within 11 ft. of the lake bed. During this work a pilot drill hole was kept continuously from 15 to 18 ft. ahead of the working heading. This was done to prospect for other possible water-bearing strata and to assure that no error in lake bed calculations had been made. No difficulties were encountered.

When the original tunnel had reached a point where its roof was within 11 ft. of the lake bed, preparations were made for the final blast. Under the direction of a service man from the du Pont Powder Company, some 2¾ tons of 90-per-cent dynamite was placed to move the 700 cu. yd. of material remaining. In addition to this, five 6-in. holes were drilled down from a point near the lake



Condensed profile along center line of conduit. Plan view of the pressure line, surge tank and powerhouse.

shore to within close proximity of the tunnel roof at the heading. Each of these was loaded with 300 lb. of 90-per-cent dynamite, the purpose of which was to throw off as much as possible of the overburden and thus prevent its slipping down into the opening created by the main charge. The loading of the main charge was concentrated in two small pockets excavated in the side walls of the original tunnel and close to the heading. From these pockets radiated horizontally some thirty holes extending 10 ft. further toward the lake. These were loaded with 90-per-cent dynamite to assist in the severance of the material to be moved by the shot.

During the preparation of this shot three bulkheads were placed in the tunnel. One of these was located at the junction of the original with the branch tunnel and was designed to close permanently the original tunnel as soon as the lake level had been drawn down sufficiently to permit construction of the headworks. The second bulkhead was intended to prevent water flowing back into the branch tunnel during the draw-down period. The third was installed at the lower portal and was designed to close the tunnel tightly. After the loading had been completed the tunnel was filled with water to act as backing for the shot.

To insure the positive firing of all charges three separate firing systems were installed. These were a series system, a parallel system (both electric), and a Cordeaux fuse system ignited electrically at the ground surface. The Cordeaux was installed as a precaution against possible water difficulties in the electric circuits. The shot was fired at 2:40 p.m. Sept. 25, 1924, through the closure of the 440-volt control circuit by M. E. Buck, general superintendent. The third bulkhead at the portal 900 ft. away was carried away, the initial failure apparently being toward the lake. Attendant preparation and the shot itself cost about \$50,000.

Complete success was achieved as far as making an opening into the lake was concerned. However, the nature of the opening was not what had been hoped for and was not entirely satisfactory. Many large rock fragments settled back into the opening and partially blocked it. It was possible to draw down the lake to the desired level only after an 18-ft. open cut was made in front of the shaft which had been constructed down the branch tunnel as the water level dropped. In view of the expense and the difficulties entailed in drawing down the lake these last few feet via the open cut method, all concerned were completely satisfied with the

explosion method chosen. If the former plan of accomplishing the entire draw-down by means of an open cut into the shaft had been adopted construction time would have been lengthened at least four months.

After the lake was drawn down to the minimum possible level a cofferdam was constructed and the necessary concrete work carried on behind it. As this portion of the work was undertaken during the winter months, the inflow was at a minimum and it was necessary to open the cofferdam to re-drain the lake only about once in four weeks. This fair progress was possible without water interruption. The tunnel was lined for a distance of 85 ft. from the intake gates on account of the unsatisfactory condition of the ground passed through. The entire headworks concrete structure, including the tunnel lining and the control shaft, was completed in about 60 days. The head gates were ready for service March 10, 1925.

All of the concrete was handled and mixed in a plant located on the hill above the entire workings. Raw materials in sufficient quantities had been developed, washed and stored at the lower end of the lake. These were delivered to the mixing plant as needed. The storage bins at the plant were heated by means of 2-in. steam pipes laid on the floor of the bins. Steam was supplied from a 15-hp. boiler which also supplied the hot water for the mix. Material was delivered to the forms at an average temperature of 50 deg. F. All of the form work was well housed and protected and heated by means of salamanders and electric space heaters. The resulting job was entirely successful even though the weather was severe at times.

The intake gate is of wood suspended from a steel stem the upper end of which is connected to a worm-gear electric hoist controlled from the power house. This distant control is effected by means of a polarized relay connected to the telephone line between power house and head gate station. The relay is actuated by impressing 120 volts d.c. to the telephone line. Conditions are such that the operation of the telephone lines is not affected seriously. The trash racks are sheathed over to

a level below the surface of the lake and the gate chamber thus enclosed, together with the motor house, is electrically heated during the winter months.

Pipe Line

At the lower end of the tunnel a steel band was concreted into the tunnel portal to form the transition between the tunnel and the pipe line. In the concrete block and just ahead of and below the steel connection is located a sand trap and an 18-in. sluicing valve. To assure a tight joint between the rock and the concrete transition block grout pipes were cast into the block. After the block had set, grout was forced through these pipes under a pressure of 80 lb. This same procedure was used for the tunnel lining at the intake end where the bad ground was encountered. Only about 250 sacks of cement were required for this job.

To the steel connection at the lower end of the tunnel was joined the 56-in. wood-stave pipe. This pipe was constructed by the Continental Pipe Company of Seattle under contract. The wood staves are $2\frac{1}{8}$ in. thick by $5\frac{1}{2}$ in. wide. Thirty-four staves are used in the roundabout. A spacing of $3\frac{1}{2}$ in. is maintained for the $\frac{5}{8}$ in. round steel bands for the first 4,000 ft. from the tunnel connection. Beyond that point the spacing is 3 in. The power company furnished the pre-cast concrete saddles and 13 special steel angle sections. It was cheaper to use these steel angle sections than it would have been to have removed the material necessary to have provided a right of way with the necessary long-radius bends required for continuous wood-pipe construction.

Connection between the wood pipe and the steel angle sections is effected by the use of pure para rubber gaskets about $\frac{3}{8}$ in. in diameter. Three gaskets are used for each joint, the first being placed $1\frac{1}{2}$ in. from the end of the wood; the second 3 in. from the first and the third 15 in. from the second. The total lap of the wood over the steel is about 30 in. By drawing down the wood by means of the encircling steel bands these special circular gaskets are highly compressed and formed an excellent water seal for the necessary 70 to 100-ft. head. Two gangs of 9 men each erected this pipe line in 45 days actual working time.

At the lower end of the wood pipe is a special T fitting one end of which connects to the pressure pipe and the other end of which connects to a Johnson surge tank designed to care for pressure fluctuations in both the flow line and the pressure line that might be caused by load variations at the power house. The same rubber-gasket joint construction was used for the T connection to the wood pipe as was used at the various angles. From the T the pressure line is of Kellogg butt-welded steel pipe 48 in. in diameter and 2,700 ft. long. The thickness of the pressure line varies from $\frac{1}{2}$ in. at the top to $1\frac{1}{4}$ in. at the bottom where the pressure guarantee is 650 lb. Pipe sections are about 20 ft. long and each joint is so made that there is no reduction in effective area at the joints.

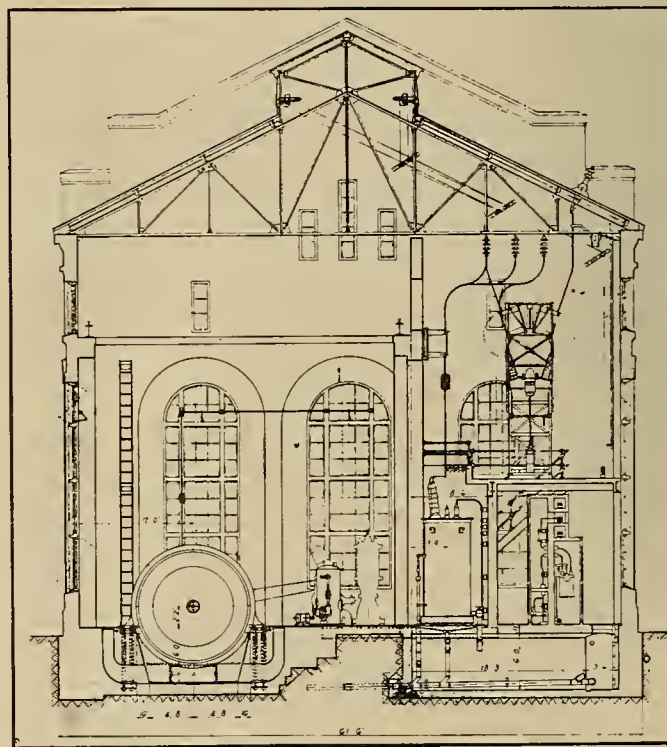
Concrete footings support the line and ten expan-

sion joints provide for longitudinal movement. Each expansion joint is midway between permanent, rigid anchor piers. Intermediate piers are provided with roller bearings for the pipe to facilitate readjustment and to reduce wear and tear on the pipe itself. These bearing piers are placed 20 ft. apart. The lower 400 ft. of the pipe line is in a back-filled trench and hence not subject to extreme temperature changes. This section of the line is not mounted on roller bearings, but is supported on concrete piers spaced 20 ft. apart. The gate at the intake and the 48-in. butterfly valve at the point where the wood pipe joins the steel pipe both are electrically controlled from the control board in the power house.

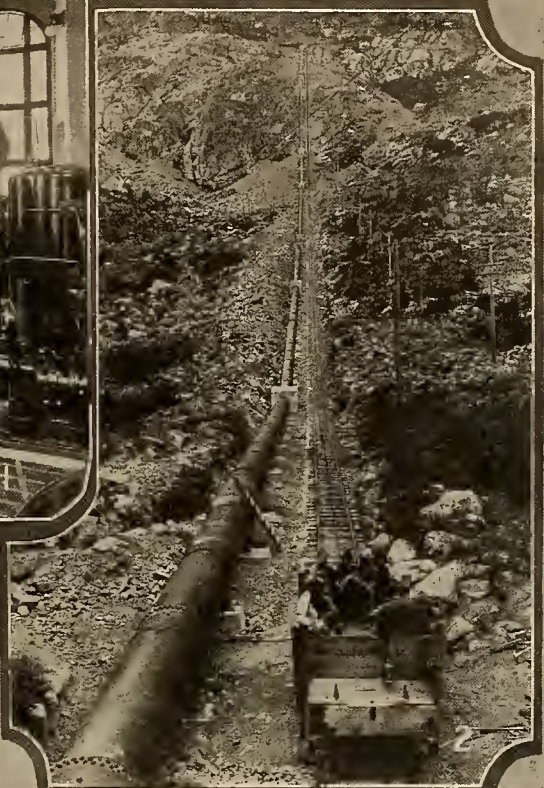
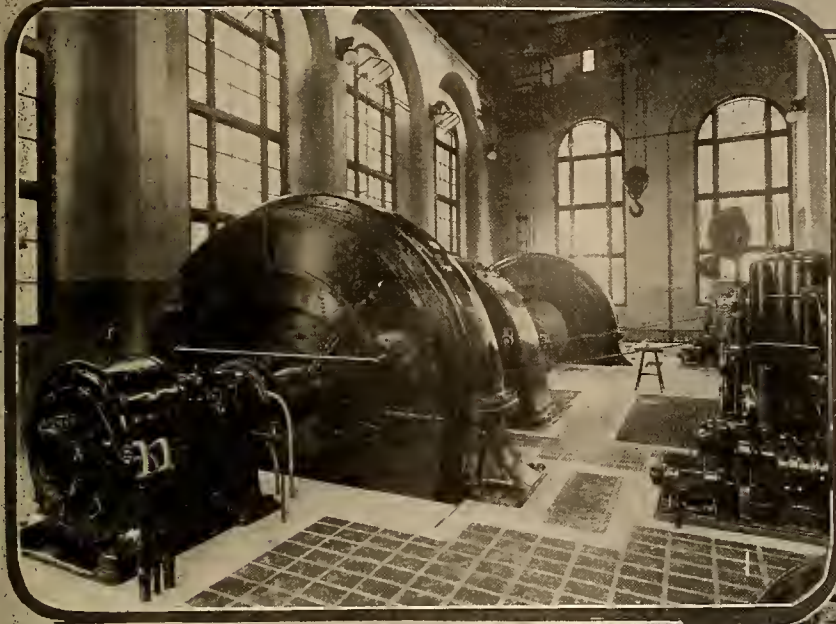
Power House

Reinforced concrete was used exclusively in the construction of the power house. This material was selected after an extensive investigation had been made of the possibility of using native rock and also brick. The native rock is difficult to face and brick delivered to the job would have cost \$50 per thousand. The building is approximately 60 ft. wide and 85 ft. long. The main operating floor is 35 ft. wide and 84 ft. 6 in. long. On this main operating floor are mounted the two generating units with their direct-connected exciters, the governors and governor oil-pump equipment and an auxiliary motor-driven exciter. Nearly opposite each generator and on the penstock side of the building are the 8 x 14-ft. transformer bays. Between these bays is located the main switchboard and control board. The 6-kv. bus structure, station service bus structure, battery, generator rheostats and other miscellaneous equipment fill the rest of the available space on the ground floor.

A second floor is constructed over that portion



First floor plan of power house.



SCENES on the Mystic Lake project of The Montana Power Company. (1) Floor of the generating room showing the two 6,250-kva. Pelton-Westernhouse units. (2) Looking up the 2,700-ft., 48-in. Kellogg butt-welded pressure pipe. A single line supplies both generating units. (3) Part of the 9,000 ft. of 56-in. Continental wood stave pipe which forms the connecting link between the 1,000-ft. tunnel and the pressure line. (4) The power house is of reinforced concrete throughout and is laid out to accommodate all equipment indoors.



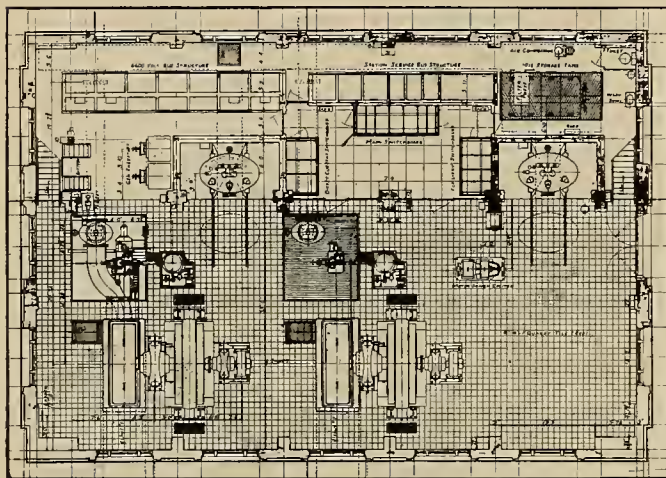
occupied by the transformers, switchboard and other similar equipment on the main floor. The entire high tension switching and control bus and equipment is located on this second floor, indoors. This floor is 22 ft. wide and runs the length of the building. The roof trusses overhead and the building columns at the walls mark this space off into five natural divisions. The two end spaces are occupied by the high-tension oil circuit breakers on the two

off from one unit without interfering with the operation of the other unit. These gate valves were especially designed and built for this application by the Pelton Water Wheel Company.

Each of the two main direct-connected exciters and the spare motor-driven exciter are rated at 50 kw., 125 volts. Each is sufficient for two generators. Two 6,000-kva., 3-phase, 60-cycle, oil-insulated, water-cooled 6.6-6.9-7-2-kv. delta/55-kv. Y, Westinghouse transformers, one for each unit, are connected between the low-tension and the high-tension buses.

Electrical Arrangement

Each generator is tied to the single low-tension bus through a General Electric oil circuit breaker and a single set of disconnecting switches. The low-tension bus is sectionalized by two sets of disconnecting switches so arranged that the station service transformers may be fed either from one generator or the other should it be desirable or necessary to kill one end of the bus at any time. Each transformer is tied solidly through a set of disconnecting switches to its section of the high-tension bus and is tied to the low-tension bus through an oil circuit breaker and a single set of disconnecting switches. Oil circuit breakers on each of the outgoing lines provide the necessary control for the proper handling of power. Here again, two sets of disconnecting switches divide the bus into three sections, one for each transformer and each line position and one in between for the future line. With this arrangement it is possible to operate each generator as a separate unit clear through to



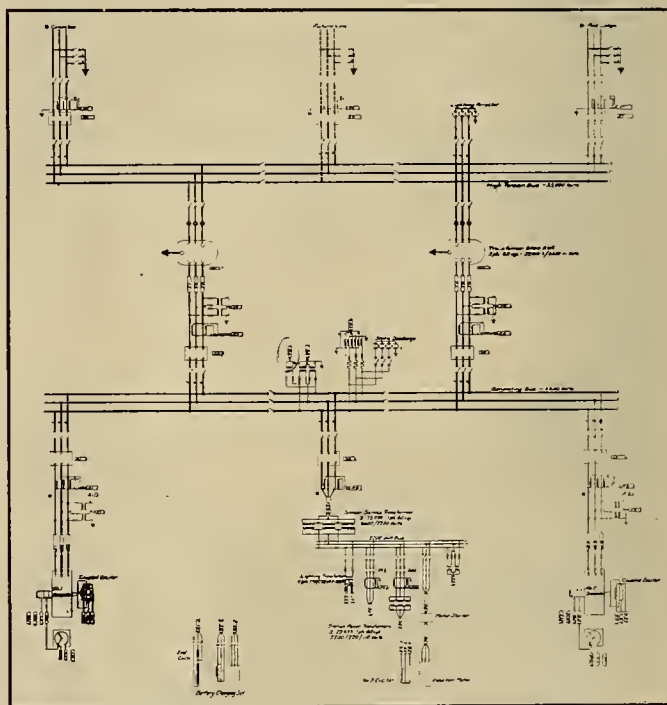
Section through power house at generator position.

outgoing lines. The center division provides the necessary space for a third and future line. One of the remaining spaces is filled by the lightning arrester. The fifth space is unoccupied at the present time.

For the convenient handling of the equipment a 40-ton crane spans the operating floor and runs the length of the building. Each transformer is mounted on a car the rails for which extend far enough into the operating room to enable the transformer to be brought under the crane. There is nothing beneath the operating floor except the transformer oil storage tank and the necessary pits under the generating and governing equipment.

Machinery and Equipment

Generating equipment consists of two Westinghouse generators each driven by a single Pelton wheel. The rating of each generator is 6,250 kva. at 0.8 power factor, 3 phase, 60 cycle, 300 r.p.m., 6.6 kv., while the rating of each wheel is 7,500 hp. at 300 r.p.m. under an effective head of 1,010 ft. The water wheels are mounted directly on the flanged end of the generator shaft and the arrangement makes a neat, compact, two-bearing unit. The shaft is 18 in. in diameter and the bearing that carries the overhung water wheel is 40 in. long. All bearings are water cooled. The usual arrangement of interconnected, interlocked main and by-pass needle nozzles are controlled normally by the belt-driven oil-pressure governor, but may be controlled by hand when necessary. Immediately ahead of each nozzle between the unit and the penstock is located a 28-in. hydraulically operated gate valve for each unit. Since the water for the plant comes down through a single pressure line it was necessary to install these valves in order that the water might be shut



Wiring diagram showing electrical arrangements.

the outgoing line should such a scheme of operation be expedient. To obviate the necessity of bringing out the generator neutrals and the installation of an additional set of current transformers a set of power directional relays provides the equiv-

alent of differential protection for the generators. Overload protection also is provided on the outgoing lines.

All three exciters may be connected to a common exciter bus through the necessary switching and control equipment. However, normal operation calls for each direct-connected exciter to carry its own generator except in emergencies when the spare exciter may be called upon to carry one or the other of the generators. In this way it is possible to provide spare exciter service with a minimum size and amount of machinery.

A single aluminum-cell lightning arrester is connected to the high tension bus. Operating experience over a period of years with the company seems to have shown that this type of lightning arrester installation is satisfactory.

Conclusion

After having stood for five months the pipe line was filled with water March 15, 1925. Within a week practically all of the leaks which originally showed had closed of their own accord and it was necessary to give special attention to only a very few. During the following 48 hours the pressure line was filled gradually up to the full static pressure of 450 lb. No leaks developed. After a 36-hr. run-in period the first unit was synchronized on the line with the rest of the system at 8:40 a.m. March 20, 1925. The second unit followed shortly afterward and both have been operating nearly continuously since that time.

New Method of Merchandising Ranges

AN entirely new idea in the merchandising of electric ranges has been developed in Winnipeg, Canada, where 4,330 ranges have been added to the lines of the city "Hydro" within the period of a year and a half. The present record is 19,000 electric ranges on the city lines, with a city population of only 200,000.

The selling campaign has divided itself into two major divisions. To individual consumers ranges, including installation, are sold at \$15 down and \$5 a month. To apartment house owners, ranges are rented, or virtually sold on an eleven-year basis without any initial expense for wiring or equipment.

An extensive advertising campaign carried on among apartment house owners and also among those who rent apartments has been largely instrumental in bringing about this result. Billboards in conspicuous locations throughout the city and letters addressed to tenants were among the methods used.

The scheme in brief is this: Any apartment house owner, which means the owner of any rented quarters from a double house up, may have ranges installed in his apartments free of charge upon signing an eleven-year contract by which it is guaranteed to pay 1 cent additional for every kw-hr. used on the range during that period. The domestic rate for electric cooking in Winnipeg is 1 cent per kw-hr. with a 10 per cent discount, or net

.9 cent per kw-hr. and the additional charge brings the figure up to 1.9 cents per kw-hr., leaving the operating cost of the range still below that which is possible with gas. During the period of the contract, the owner may purchase the ranges upon payment of the retail price minus a depreciation charge of 3/4 of 1 per cent per month for every month the contract has been in operation. In other words, the ranges mechanically become the property of the owner in eleven years' time.

Recently the scheme has been slightly modified so that the owner pays for the wiring, either outright or on a ten-year basis, paying \$10 down and \$2.70 every half year. Instead of the kw-hr. basis of payment, an equivalent sum of \$1 per month on all ranges costing \$70 or under, or \$1.25 on ranges costing more than \$70 is charged.

Three types of ranges are sold at prices ranging from \$65 to \$92.50. These were selected after severe tests to determine the most durable equipment and that requiring the least maintenance. Records kept on one of the types of range used are said to show a cost of maintenance to the city department of 1.7 cents per month per range. In figuring the merchandising returns from the plan, \$1 a year per range has been allowed for maintenance costs. Ranges are sold at wholesale prices plus a \$7 handling cost.

The investigating committee which sanctioned this plan of merchandising on the basis of its financial returns submitted a report which purports to show an annual merchandising profit to the city of some \$5,800 on 5,000 ranges, not to mention the return in the current consumed, which it is figured amounts to \$140,000 annually. The ranges are to be paid for in eleven years time, with a 5 1/4 per cent interest return on the investment during that period. The figures follow:

Cost of 2,500 stoves at \$70.....	\$175,000.00
Revenue	Per Year
2,500 stoves at \$1 per month or \$12 per year	\$ 30,000.00
Expenditure	
Interest at 5 1/4 per cent.....	9,187.50
Sinking fund, 11 years.....	12,644.00
Maintenance at \$1 per stove.....	2,500.00
10 per cent vacancies.....	3,000.00
	\$ 27,331.50
Annual estimated profit.....	\$ 2,668.50
	\$ 30,000.00
Cost of 2,500 stoves at \$90.....	\$225,000.00
Revenue	Per Year
2,500 stoves at \$1.25 per month or \$15 per year	\$ 37,500.00
Expenditure	
Interest at 5 1/4 per cent.....	11,812.50
Sinking fund, 11 years.....	16,258.00
Maintenance at \$1 per stove.....	2,500.00
10 per cent vacancies.....	3,750.00
	\$ 34,320.50
Annual estimated profit.....	3,179.50
	\$ 37,500.00

The small profit, it is figured, will be sufficient to care for under-estimations or unforeseen contingencies.

Utility Company Sells Itself by Means of Small but Effective Window Display

WINDOWS of power company offices have been used for the effective display of merchandise, for the sale of appliances, and occasionally for simple decorative effect, but it is not often that imagination and creative effort are used to make of windows potential good-will builders of educational exhibits. Yet in the case of the Southern California Edison Company, in the small window near its Los Angeles main office building entrance, such window displays have demonstrated that the thing can be done and done exceptionally well.

Originally the small window, located on the Third Street side of the Edison Building, about 25 yd. from

lighting sometimes is used for some window arrangements to bring out color values to best advantage. The displays are changed about every two months, the thousands of people who pass them daily being given full opportunity of seeing the displays so carefully and painstakingly prepared.

The first displays dealt with securities of the company, an enlarged photograph of a stock certificate, and various other graphic illustrations relative to stock distribution making up the display. From this the displays took a turn toward properties themselves. The equipment used in stream gaging to measure water flow to the Edison Big Creek plants was used, each article clearly labeled and explained. Another display was made up of various types of residence and power electric meters, together with testing apparatus for determining their accuracy, and photographs of meter-testing, laboratories and methods. A typical pole top, each lead labeled and explained, made another fascinating "attention-getter," for few people know what all the apparatus at the top of a pole is, or what it is for, and are often curious to know. Types of buckets, with pictures of the units on which they are used, made an interesting "inside" display of water-power turbine mechanism.

Among the most effective displays of this nature were those of the 220-kv. line, and especially so was that dealing with the progress of the Lake Florence tunnel job. Effective charts, photographs, actual rock drills and samples of the granite from the tunnel gave the display unusual interest. And a rather subtle comparison of the time taken to drill this tunnel as compared with that taken to drill the distance between two Los Angeles streets, through which the city was having built a short traffic tunnel that was despaired of ever being finished, gave just the right "tang" to this evidence of the achievement of private initiative in a bigger undertaking.



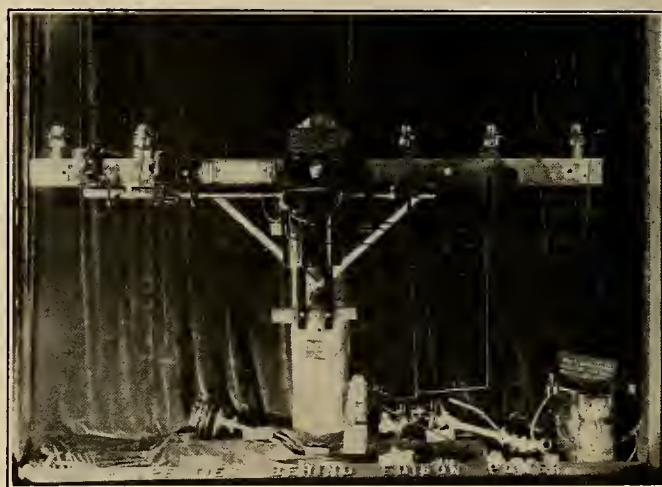
A display featuring equipment used on the pioneer 220-kv. line.

the corner of Broadway, Los Angeles' main thoroughfare, was put into use to stimulate the sale of securities. Gradually, however, with the idea growing of its own momentum, less and less direct reference has been made to the securities sale feature, and more and more emphasis has been laid upon the physical properties forming the background of the organization.

Telling and selling the story of the properties back of its project, the Edison company has with these cleverly arranged window displays evolved a highly satisfactory form of publicity. For a central-station company with no merchandise to sell at its main office, the adoption of this method of putting its story before the public is therefore distinctly unique.

The window is very small. It is but 9 ft. wide, 8 ft. high and 2 ft. deep. Yet by ingeniously designing the displays and capitalizing to the utmost the human interest features of the company's work, they have been distinct attention provokers.

For night illumination ten 100-watt lamps in Holograph reflectors are used. The lights are arranged to flash on and off at 30-second intervals. Colored



A typical pole top on a distribution line makes an attention-getting display.

HOW well a central-station company, without merchandise to sell, may utilize its windows for selling itself to the public it serves, is demonstrated in these displays from the small window of the Southern California Edison Company, near its main office entrance, Third Street, Los Angeles. (1) A display of equipment used in stream gaging in the Big Creek region. (2) One of the original displays, primarily aimed at the prospective security buyer. (3) Various types of buckets used on the water wheels in the hydroelectric plants of the company. (4) Meters and meter-testing apparatus attest to the accuracy of electric meters. (5) The score board of progress on the Florence Lake tunnel job, together with machines used to drill it, and granite from the tunnel. Each window display was designed to explain in simple terms the various objects used in company operation.

SOUTHERN CALIFORNIA EDISON COMPANY



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SOUTHERN CALIFORNIA EDISON COMPANY



Cement Duct as Manufactured and Used in California*

CONCRETE duct has been known and used in California only during the past two or three years. It has therefore been in the experimental stage only as far as this section of the United States is concerned. We understand that in certain sections of the Middle West and of the East, particularly in Chicago, the electric utilities have been using it for a number of years and, in fact, are now using it at the rate of approximately 3,000,000 duct ft. a year in the latter city. (We plan to secure additional data from the Chicago utility, which will help us in our consideration of the subject.)

Its large use by this utility seems to indicate that it has considerable merit, and possibly offers some desirable features and characteristics which justify its use in quantity for underground duct construction. It was introduced into California, not through a demand created by the electric utilities, but through the efforts of certain manufacturers of concrete products to increase their output by reaching out into other fields which had not as yet been touched.

A manufacturer in southern California made up a considerable quantity of duct in an effort to establish a market, but this did not immediately materialize, probably because the utility engineers were just a little skeptical about its application and did not wish to experiment, but chose rather to continue the use of duct with which they were familiar. A manufacturer in northern California started to manufacture concrete duct early in 1924, and in order to determine whether or not this duct could be used to advantage, the Pacific Gas and Electric Company purchased a small quantity, about 15,000 linear ft., during that year. This was installed in a distribution system, and an additional equal amount was purchased and installed in the same locality during the following year. Approximately 100,000 ft. are now being installed in another city on a transmission duct line.

Since this new type of duct (new as regards California) is of such recent origin, considerable difficulties have been experienced both in the manufacture and methods of installation. These difficulties have not all been overcome, though great improvement has been made since the first piece of duct was manufactured and it is probable, as time goes on, that the utilities working with the manufacturers will evolve a product which may be considered as high grade in every respect.

Manufacture

While the engineer is interested primarily in the finished product, a description of the methods of manufacture and the difficulties met and overcome may also be of interest. As with all new products concrete duct was not manufactured in perfect and final form from the first.

There are two major characteristics which all duct must possess in order that it may be utilized for electric underground construction. It must have a smooth interior surface and the joints must be such as to continue the smoothness where sections of duct are joined together. There are naturally other conditions which must be met as well, such as strength sufficient to permit transportation and handling; suitable means for connecting sections together; desirable lengths which are not too heavy to handle and not too long to permit turning angles, such as are ordinarily found in underground construction; ease of making repairs in case of necessity; suitable terminal methods in manholes and absence of chemicals which may react on the lead sheath of the cable.

The first two items have caused the greatest amount of difficulty, and the manufacturer has been experimenting continually in an effort to produce a perfectly smooth interior surface, or as nearly smooth as it is possible to make, and also absolutely to center the bore at the ends, and to keep the concrete intact and entirely filled out at those points.

The length has been fixed at 3 ft., as it is found

that a greater length will be too heavy to handle easily and does not provide as great flexibility during installation. These 3-ft. lengths weigh about 22 lb. for the 3½-in. size and about 25 lb. for the 4-in. size.

As the duct is now made, the wall is about ⅝-in. thick. This provides adequate strength considering a proper quality of concrete. A thinner wall would be more fragile and the breakage would probably be greater.

The method of joining lengths has been given some study. Paper collars have been employed for the purpose, but it is felt that the tin collars now used in northern California are perfectly satisfactory. These are merely a section of a can of the proper length and diameter. They must be of such length as to permit the sections of duct to come together, and of such diameter as to produce a concentric hole, taking for granted that the bore of the duct is concentric with respect to its external circumference, and also so as not to permit thin concrete mixture or grout to flow into the duct and cause an obstruction. They must, therefore, be as snug-fitting as possible, but not so snug as to prevent readily joining the ends of the duct. This requires a rather exact or close design.

After all, in duct line construction only the holes in a mass of concrete are desired, and any duct which is used acts merely as a form for the holes. Up to the present time it has been found necessary to leave the form in place after joining the envelope. A new method has been invented for removing the forms, thus leaving an absolutely homogeneous concrete envelope. We realize that such a homogeneous envelope is a desirable feature, and it appears that the use of concrete duct as a form approaches this ideal condition.

The duct manufactured in central California is produced on a McCracken machine, which employs a revolving shoe or trowel for the purpose of packing the concrete mixture inside of a metal form. The concrete is mixed in a horizontal, rotary-blade mixer at the side of the machine. After it has been thoroughly mixed, it is dumped into a bin, from which it is carried to the machine by means of a chain conveyor. The metal form is made in two sections which are clamped together and are inserted into the machine in a vertical position. The revolving shoe is started at the bottom of the form and the concrete mixture is fed in at the top. As the shoe revolves it slowly travels vertically up through the form, troweling a layer of concrete on the inside of the latter. The form is then taken out of the machine and one-half is removed, the duct being supported horizontally on the other half of the form, until it has hardened sufficiently to permit it to carry its own weight when stood on end. The ducts are cured and are then ready for shipment.

It will be noted that the smooth interior of the duct is produced by the action of the revolving shoe or trowel. However, it has taken much experiment to reach a degree of smoothness which compares favorably with other types of duct, and which is suitable for the installation of cable. In the first place, the mixture must have exactly the correct amount of moisture content. If it is too wet it rolls up under the action of the trowel and causes sharp edges and considerable roughness, whereas, if it is too dry it does not pack properly and lacks sufficient strength.

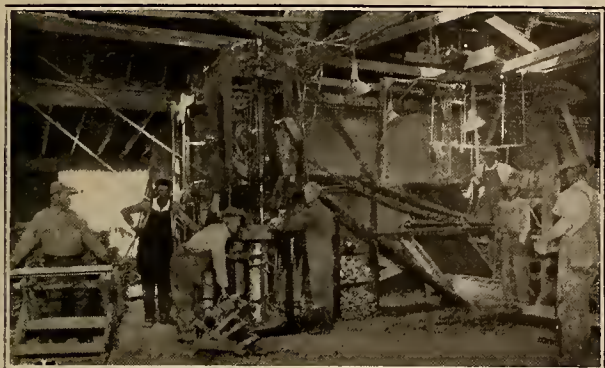
The aggregates also have much to do with the degree of smoothness produced. The manufacturer has experimented with a large number of different aggregates and has been successful in producing a duct which is as smooth or smoother than fiber duct. However, eternal vigilance must be exercised to insure uniformly good quality. Because of the abrasive effect of the aggregate, the shoe wears and produces grooves inside the duct, the edges of which may be rough. The mixture may not pack properly at the ends so that they crack or break off when one-half of the mould is removed. The thickness of the sheet steel forming the mould has much to do with the perfection of the duct. Too thin steel spreads at the joints under the action of the trowel.

The small amount of water which is added also assists in increasing the strength. It has been found that a 3-ft. length, supported on both ends, will easily carry the weight of a man in the center. This readily permits transportation and installation. In addition, the manufacturer found that the speed of revolution

* Serial report of the Underground Systems Committee of the Pacific Coast Electrical Association, presented at the Los Angeles meeting of the Underground Committee, Sept. 25, 1925, by Henry H. Buell, chairman of subcommittee; R. P. Lutzi, H. C. Moyer, all of the Pacific Gas and Electric Company.

and the vertical speed of the trowel has much to do with the quality of the duct produced. If the duct is stood on end when curing under the action of steam and water, the lower end is liable to disintegrate. These are just a few of the difficulties which have been found and corrected.

With one machine and an average crew, it has been possible to manufacture 3,000 linear ft. of duct in one day. This quantity, of course, varies from day to day for different reasons. It has been transported by



Equipment used in the manufacture of concrete duct. The process is described in the accompanying article.

truck and trailer from the factory to the job, at the rate of about 2,500 to 3,000 linear ft. per load over a distance of 50 miles with a very small percentage of breakage. This is a fairly good indication of its strength.

Installation

So far no particular difficulty has been experienced in installing concrete duct, at least no greater difficulty than is found with other types of duct. Although the walls of concrete duct are thicker than fiber, for instance, the spacing between duct and the outer envelope can be made slightly smaller to compensate for this extra thickness so that the trench need not be any wider. When the sleeves or collars are the correct diameter, a man can readily joint the lengths. In fact, this is probably a simpler matter and more easily done than with other types of duct.

The method employed is the same as heretofore used by everyone doing underground construction. The trench is prepared of correct width and with smooth floor. A layer of concrete is poured, a layer of duct placed and these are covered. Another layer is placed and covered, and so on until the required number of duct have been placed, after which the top layer of concrete is poured. The consistency of the concrete should be such as to readily flow around the duct so that it will, to a certain extent, adhere to and become a part of the concrete duct. On the other hand it should be dry enough to permit working on it in a reasonable length of time to install additional layers of duct, and so as not to permit the duct to sink into it.

In some cases spacers have been used to insure perfect alignment of the ducts as they are placed, and these are later removed before the next layer is put in position, but it is not felt that these spacers are necessary. The concrete duct does not float as rapidly as does fiber, which assists in its installation to a small degree.

It has been considered advisable in some instances to rod the duct as soon as possible after it is laid, and to brush or swab out the interior to remove any loose grit or sand which may have accumulated while it was being laid. In order to determine whether or not the joints were smooth and straight a mandrel $3\frac{1}{4}$ in. in diameter was drawn through the first 15,000 ft. of $3\frac{1}{2}$ -in. duct which was laid. It passed perfectly freely through all of it with the exception of one spot where a small amount of grout had seeped in around one of the collars. This happened to be close enough to a manhole so that it could be reached. In any event it was not serious as the cross section was reduced very little and the grout had hardened perfectly smooth.

Comparison with Other Types of Duct

Concrete duct has one marked advantage, other things being equal, at least to those who are located close to the point of manufacture. It can be secured in quantity on very short notice, and there is no need to tie up capital in idle stock. In fact, if the manufacturer does not have stock on hand, he can make it up and deliver it within two weeks very readily, and in case of an emergency it can be turned out sufficiently cured to handle in one week.

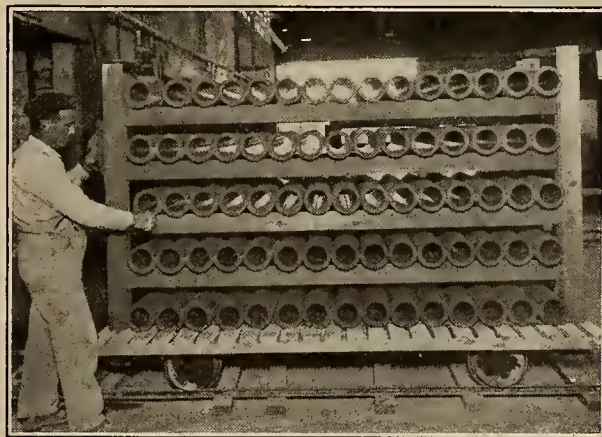
The cost of the duct itself has been made practically the same as fiber delivered on the job. Its installation cost, all things considered, is so nearly the same as fiber that it is difficult to distinguish a difference. Often there is a material difference in cost of installation of one type of duct in several different localities because of various conditions, and we have not gone far enough to be able to give comparative figures which would be of value. One Eastern company, which has used a great deal of concrete duct, has its underground construction done by contract. Each contractor bids on three types of duct: fiber, clay and concrete, and their figures are the same for all three.

One Eastern engineer has stated that the heat dissipation through concrete duct systems is practically the same as for fiber duct, and that the heat flow through both is increased as the size of the cable is decreased, the duct size remaining the same.

There is the matter of corrosion of the lead cable in concrete duct. This has always been the major point which has been raised by engineers against the use of concrete. It has, however, been refuted practically conclusively by those companies which have used concrete in large quantities. They have pulled cables which had been in concrete from ten to twenty years and have not found a single case of corrosion.

Naturally, most engineers can cite cases where they know that concrete has caused corrosion, but these cases will be found to cover primarily the use of concrete fireproofing. This is an entirely different matter and is explained by one engineer as follows:

"Cured concrete, that is where crystallization has completely taken place and the cement content has become thoroughly hydrated, has absolutely no detrimental effect on lead, which might be evident had the concrete been placed in contact with the lead when wet and allowed to set, in which case it might be possible for damaging deposits to be made on the



A batch of newly cast concrete duct sections on their way to the curing sheds. The smoothness of the bore of the duct section is indicated by the reflection of light through them.

lead while the process of crystallization was taking place in the concrete."

This explanation seems a logical one, as does the remarks of another engineer, who states that a laboratory test is not at all conclusive since any results can be produced in a laboratory and that experience is after all the best teacher.

Eastern companies have found that there is some abrasion of the lead sheath, but that this abrasion is after all negligible. An examination of a large amount of cable which had been pulled as many as six times showed no cuts in the lead sheath greater than $1/32$ -in. deep.

CENTRAL STATION CONSTRUCTION OPERATION AND MAINTENANCE

Forebay Gates Operated from Plant Control Board Dial-Type Selector Switch for Remote Control of Head Gate Motors Uses Minimum Number of Conductors

By T. J. LOVELL, Engineering Department, Southern California Edison Company,
Los Angeles

Rather than depend upon telephone communication and a gate tender for the operation of the forebay gates at the Kern River No. 3 plant, a system was installed whereby these gates could be controlled directly from the powerhouse switchboard. At that installation there were two penstock gates and a relief gate to be controlled. This meant that quite a large number of conductors would be required between the forebay and power house if each gate were to have its own individual set of control wires. A study showed that, with three gates to be controlled, a saving could be made by using a selector switch at the forebay and one set of control leads between forebay and power house. Naturally, as the number of gates to be controlled is increased the saving is increased proportionately.

At the time that plant was designed

there were no known devices on the market that would accomplish this purpose reliably. There now are several apparently satisfactory devices. Accordingly, the engineering department developed a dial-type selector switch which has proved very satisfactory in service. Similar installations later were made at Big Creek No. 1, Big Creek No. 2 and Big Creek No. 3 where they control five, five and three gates, respectively.

The selector switch consists essentially of a dial made up of ten concentric rings which are divided into eight sectors, each sector controlling one gate. Five of these rings are continuous electrically, but construction reasons made it desirable to divide all ten rings into sectors. A rotating arm, driven by a 1/20-hp. motor through a train of reducing gears, has five brushes located along its length in such

a manner as to connect adjacent rings in pairs, that is, five circuits are closed. One ring of each pair (all eight sectors) is connected permanently to the master control at the power house. Each sector of the other ring of the pair is connected to the individual gate-control mechanisms. Thus it will be seen that when the arm is resting on any particular sector five circuits are completed between the master control and the gate to which that sector is connected. One circuit is for opening, one for closing, one for red lamp (indicating closed gate), one for green lamp (open gate), and one to indicate which particular sector the arm is resting on at any particular time.

Continuity of service could be maintained best by fusing the bus for the gate motors but leaving the individual disconnecting switches to the motors unfused. By installing three lamps at the power house and connecting them in star across the bus at the forebay, a continuous indication as to "readiness to serve" is obtainable at the control board. The blowing of a fuse or an open circuit from any other cause will extinguish one or more of the

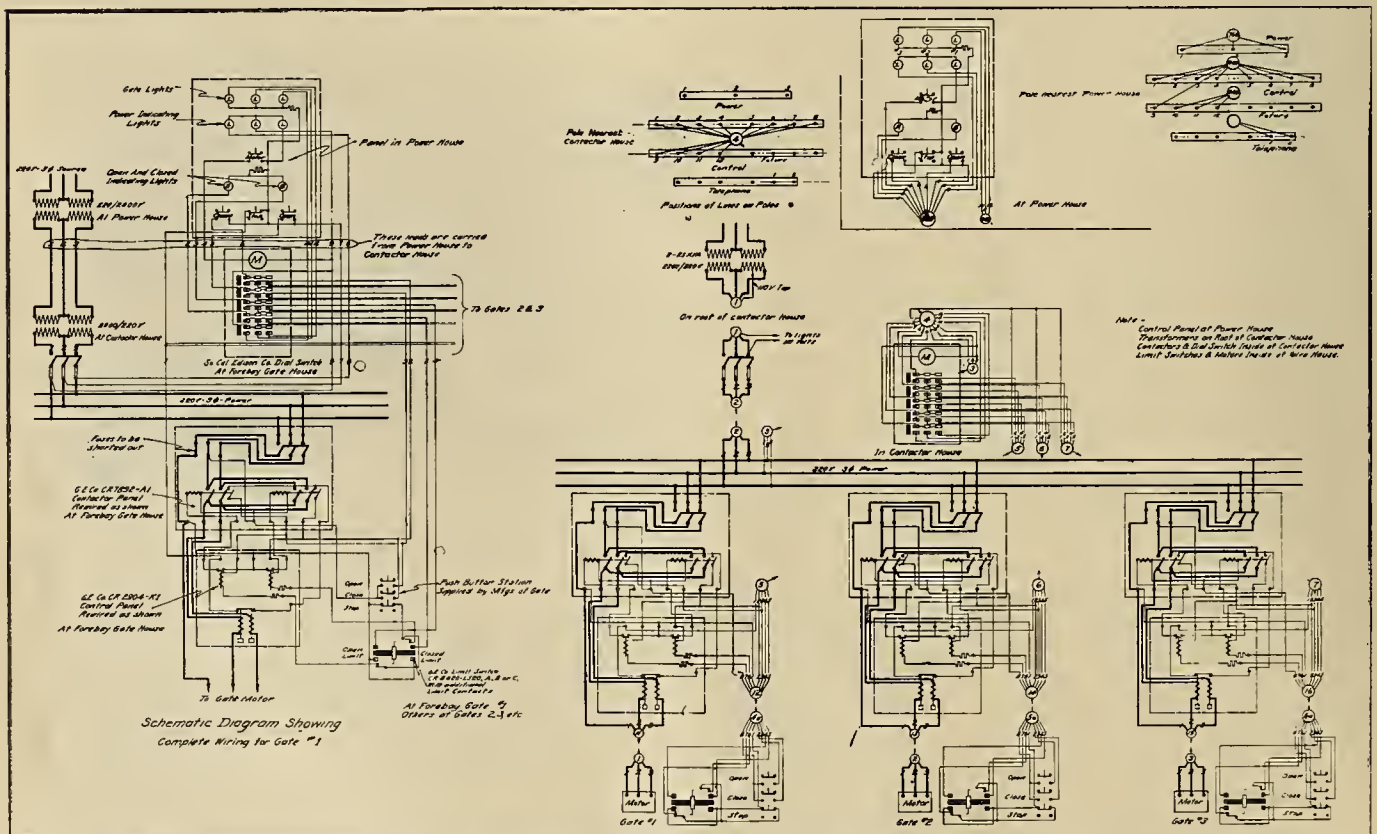


Fig. 2. Three-line wiring diagram of system for remote control of penstock gates. The operating mechanisms are located at the forebay and the control and position-indicating devices are located at the power house bench board.

lamps, and if the trouble is confined to one leg an indication will be given showing the leg in trouble. The operator thus has knowledge at all times as to the readiness of the apparatus to function. He may check the positions of the gates at any time by rotating the dial switch, the indications appearing in sequence as the arm rotates.

The sequence of operation is quite simple. The operator presses the motor button causing the switch arm to rotate. As each position is passed a lamp lights. When he has reached the position desired he releases the button and the arm stops almost instantly. The open (or close) button then is pressed, causing a contactor at the forebay to close and lock itself in that position until released by the action of the limit switch or by the pressing of the stop button at either the power

house or the forebay. Therefore it is not necessary to hold the button down until the operation is completed. Consequently the operator immediately may move the dial switch to another position and start another operation. It follows that the entire group may be operated simultaneously by rotating the switch while holding the closing (or opening) button down, causing the contactors to pick up in fairly rapid sequence. The operation of the gate (or gates) may be stopped instantly by pressing the stop button at either the power house or the forebay. Local push-button stations are provided at the forebay with their open and close buttons connected directly to their mechanisms but with their stop buttons in series with the master-control circuit. Thus a gate may be started from the power house and stopped

from the forebay station, or vice versa.

In order to prevent operation by unauthorized persons the mechanism at the forebay is enclosed in a building which normally is kept locked. In addition to this the disconnect switch supplying power to the gate motor is arranged to be locked open when any work is being done or any of the equipment pertaining to that gate.

Some time after the installation of these dial switches the company adopted the policy of using the remote control for closing only, making only four circuits per sector necessary instead of five. A method also has been devised since that requires only two wires instead of three for hot-bus indicating purposes. This latter method is used at the Big Creek No. 1 installation.

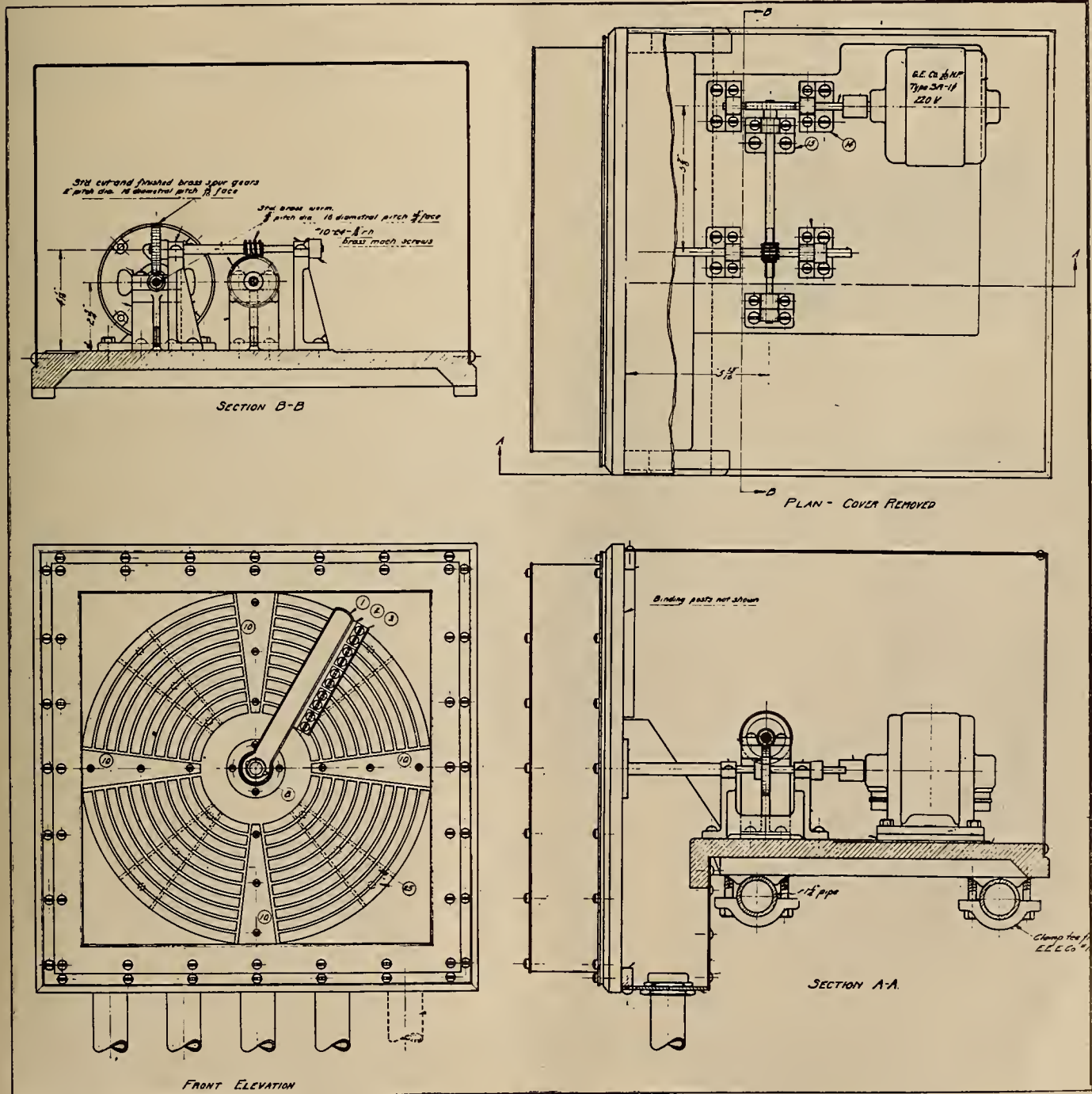


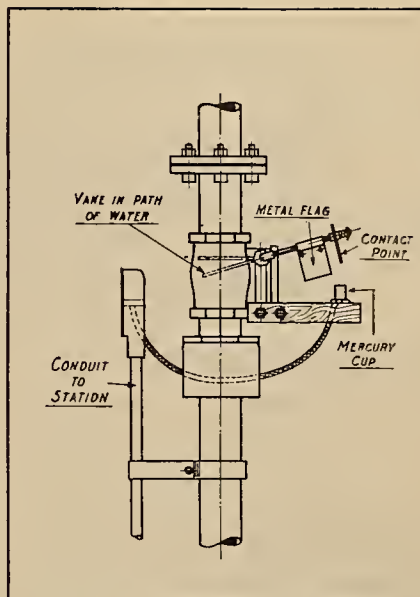
Fig. 1. Elevation, plan and section views of motor-operated dial switch for forebay gate control as developed by the Southern California Edison Company.

indicated in Fig. 1, the system being essentially the same at each end of the span. Guy wires used are 7/16-in. extra-high-strength stranded steel. Two types of anchors are used. The main upper back guys in each case are carried to an anchor consisting of a 12-ft. cedar log 18 in. in diameter set about 7 ft. (vertically) deep. The other guys terminate at cedar logs 6 ft. long and

insulator arrangement at the pole tops. The double strings of insulators supporting the span conductors are Ohio Brass high-strength 10½-in. units while the other suspension units are Ohio Brass 10-in. units. The hardware also is Ohio Brass. The 7½-in. link strain insulators used in the guys are Western Electric.

Flow Alarm Made of Standard Pipe Fitting

An interesting automatic contactor switch used in certain localities by the Pacific Gas and Electric Company for sounding an alarm in the event of drop-off or complete failure of transformer cooling water is shown in the accompanying illustrations. The pipe fitting which has been adapted to this use is a standard Crane check valve. The arm extending to the right is attached mechanically to the shaft of the valve plate or paddle and acts somewhat as a counterweight as well as carrying the moving electrical contact. The flat piece of metal fastened to this arm serves as a signal flag and counterweight which tends to keep the valve closed against the out-flow of the water. One side of the circuit is the pipe itself and the moving arm, while the other side of the circuit is attached to the little mercury-filled cup. The cup is mounted upon a piece of insulating material directly under the contact point on the arm. The



A cooling-water flow alarm made up out of a Crane check valve and a little ingenuity. A schematic sketch showing the arrangement of the working parts of the flow-alarm mechanism described in the accompanying paragraph.

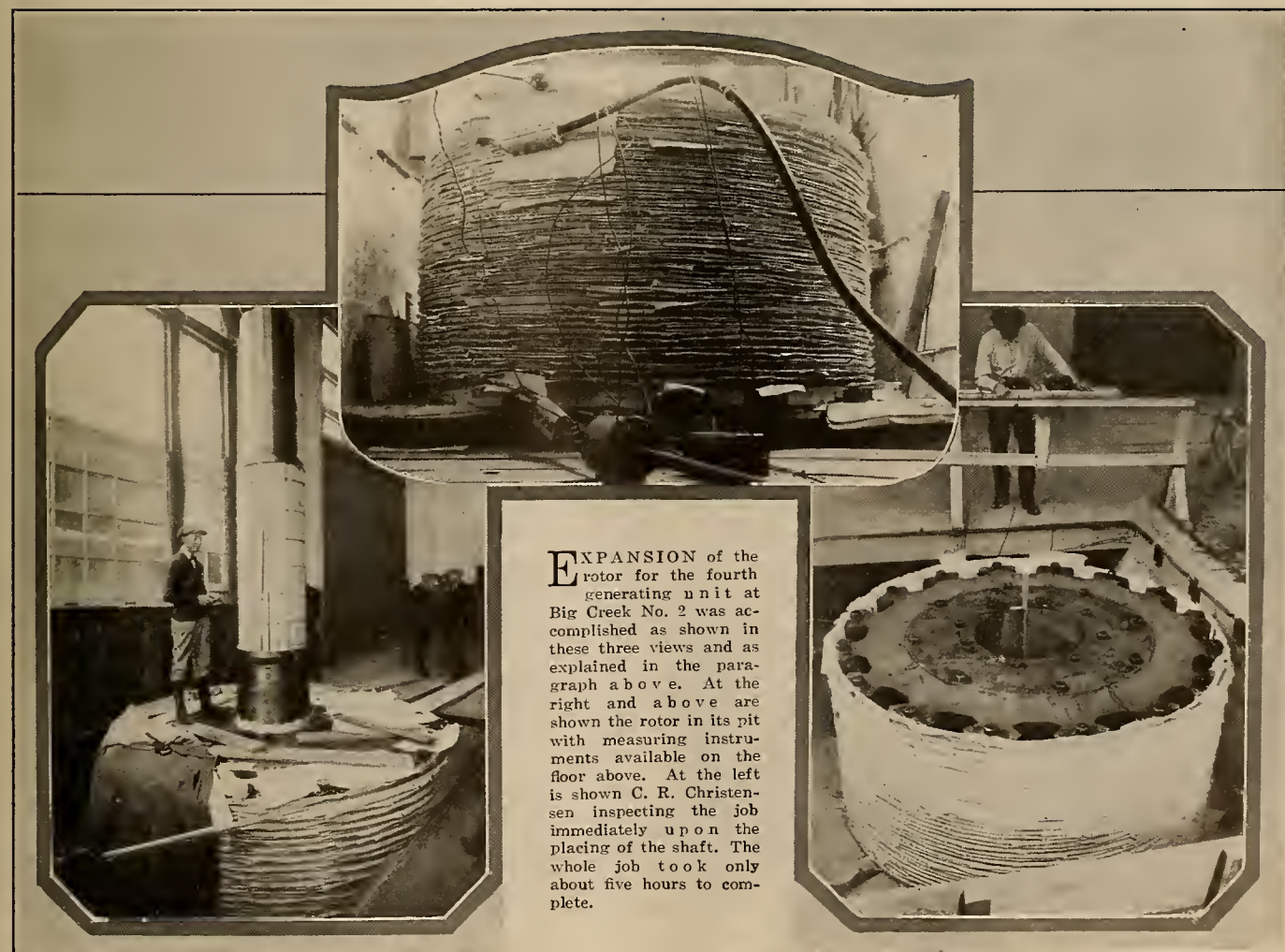


Fig. 5. Showing close-up of insulator layout at top of towers supporting 1,800-ft. 55-kv. span. Connections from the span conductors to the line conductors had not been made when the photograph was taken, but the scheme of carrying conductors through the tower structure is indicated plainly.

12 in. in diameter set from 5 to 7 ft. (vertically) deep.

Cables of the span are attached to the towers with special U-type supports bolted through the pole to back plates. Figs. 3 and 4 show the construction details of the conductor and

bearing should be kept well greased or oiled. It is not recommended that this device be used where the water is highly corrosive unless it be checked frequently and carefully.



IDEAS FOR THE CONTRACTOR

Electrical Advertising—Its Forms and Design—III

Continuing the Discussion of Types of Signs, Including Enclosed-Lamp and Silhouette Signs and Posters

By C. A. ATHERTON, National Lamp Works of the General Electric Company.

The proper lamp size again depends upon the district brightness and the distance to which the sign must carry and may be determined from the following equation:

Lamp Size for Enclosed-Lamp Signs

$$\text{Lamp Watts} = \frac{10 \times \sqrt[3]{D^3}}{\sqrt{\text{D.B.F.}}}$$

In enclosed-lamp signs it is not safe to use lamps consuming more than 60 watts each. When, therefore, the distance and surrounding brightness are so great as to require more than 60-watt lamps on 6-in. centers—as found in the equation—the lamp spacing should be reduced rather than the lamp size increased.

Color in the enclosed-lamp sign is much more effective if put into or sprayed on the opal glass of the letters than if put into the glass of the lamps or even in dips or coatings or color hoods over the lamps. When color is used, a larger number of lamps or lamps of higher wattage* should be used, otherwise the sign will appear dull and lifeless.

3. Silhouette Signs

Silhouette signs are often called shadow-graph or shadow-box signs because the picture is seen as a shadow over an illuminated background.

It is the usual custom in the construction of silhouette signs to mount the letters on short metal pins. The letters should, of course, be far enough

away from the background so that the light does not fall on their faces. When they are placed out as far as this, however, the pins are long and cast objectionable shadows.

A different effect, giving the sign individuality and at the same time eliminating the pin shadows, may be obtained by mounting the letters not on pins but on a heavy screen or a sheet of perforated metal which is suspended across the opening. If perforated sheet metal is used, it may be painted with any pleasing and non-interfering pattern desired which will show in the daytime but which will not show at night. A further variation may be introduced by using in place of the screen a very light translucent pattern or a sheet of glass on which the letters are mounted.

In this type of sign the greater brightness of the exposed-lamp sign is not obtainable; a greater emphasis should therefore be placed upon variety and artistic treatment.

For estimating the illumination of silhouette signs, it is necessary first to determine the size of the letters for a given area of effectiveness; second, to fix the location and the spacing of the lamps for uniform illumination; and third, to select the size of the lamps for the desirable degree of brightness. The size of the letters depends upon the greatest distance at which they must be effectively legible. This may be approximated as follows:

Letter Size for Silhouette Signs

$$H \text{ (in feet)} = \frac{D \text{ (in feet)}}{350}$$

in which H is the height of the letter measured on the center lines of the top and bottom strokes of the letter.

A smaller sign may often be used at some sacrifice to the advertising value but still within the limiting legibility distance which is obtained when

$$H \text{ (in feet)} = \frac{D \text{ (in feet)}}{700}$$

The lamps should be located in a line on 6-in. centers. For signs in which the strokes of the letters are 6 in. wide or more, a line of lamps should follow the outlines of the letter, located, of course, on the back of the letter and shielded from direct view of passers-by. For letters, the strokes of which are from 3 to 6 in. wide, the lamps should be located on the center lines of the back of the letter strokes and for small signs, in which the letters are too small to conceal the lamps, a line of lamps should be concealed in a trough along an upper border or preferably all around the lettering. For narrow signs, one foot or less in total width, a single line of lamps over the lettering and properly concealed, furnishes good illumination.

In large signs it is best to equip the lamps with porcelain-enamelled angle reflectors in order to utilize as completely as possible all of the available light. The saving in energy made possible by using reflectors with correspondingly smaller lamps will more than offset the cost of the reflectors. If reflectors are not used, the inside of the pattern should be painted with a

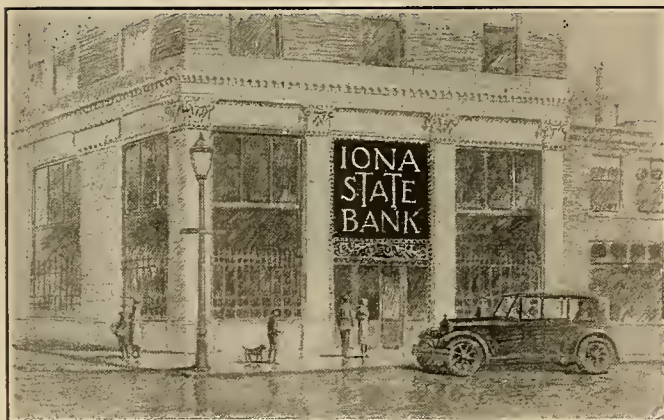


Fig. 13—An enclosed-lamp sign lends itself easily to a built-in part of the building. Architects can prevent many ugly edges to buildings they design by including in the plans provision for the electric signs and specifying the general artistic treatment.

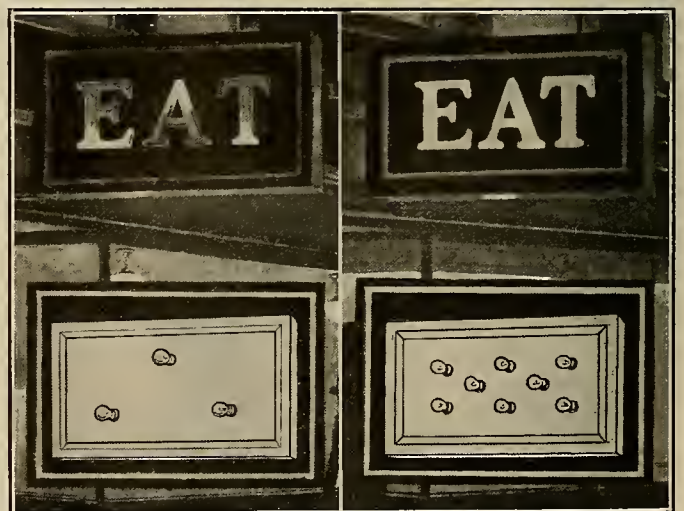


Fig. 14A—Spotty illumination of an enclosed-lamp sign. Fig. 14B—Properly spaced lamps—a lamp every six inches of the pattern surface. The number of lamps for smooth illumination of an enclosed-lamp sign equals the area of the illuminated surface in square inches divided by 40.

* See note on page 459, Journal of Electricity, Dec. 15, 1925.



Fig. 15—Left: Day view of perforated metal silhouette sign. The background inside the box is invisible. Center: Night view of perforated metal silhouette sign. A new background and an additional message appears. Letters stand out dark against bright picture. Right: Perforated metal screen used for silhouette sign.

good white glossy paint or cellulose lacquer, and a reflecting plate built into the sign, as shown in Fig. 18.

The proper size of lamps is the same as that which should be used for an enclosed-lamp sign under the same general conditions and may be determined from the following equation:

$$\text{Lamp Watts}^* = \frac{3}{10 \times \sqrt{D. \text{ (in feet)}}} \sqrt{D. \text{ B. F.}}$$

4. Posters and Painted Outdoor Advertising

- The requirements for the satisfactory illumination of poster panels, painted bulletins, or painted signs are:
- a. The average amount of illumination should be correct for the given district;
 - b. Illumination should be smooth, without any bright or dark spots, and if there must be an illumination variation, it should be from a higher level at the top of the board to a lower level at the bottom;
 - c. Lighting units should be so constructed and mounted that no direct light is thrown into the eyes of the passersby;
 - d. Glaring reflections should be minimized as much as possible;
 - e. Lighting units and their bracket

* See note on page 459, Journal of Electricity, Dec. 15, 1925.

arms should either be decorative and pleasing or inconspicuous by day.

The illumination of a small percentage of poster panels and painted bulletins is effected with concealed projectors and this practice will grow with the increasing attention to artistic treatment. Because of the difficulty of finding a satisfactory place in which to conceal projectors, and the need for individual treatment of each case in order to insure smooth, uniform illumination, the lighting is usually accomplished with equipment attached to the structure.

The standard method of illumination for all surfaces which are not more than thirty feet high (and a frequent method for larger boards too) is by means of overhead porcelain-enameled angle reflectors. Very satisfactory illumination is obtained in this way. It is not possible, however, entirely to eliminate glare spots, although they may be reduced by the use of dull surfaces either in the paint or the paper. So far the units have not been made decorative enough to be really pleasing except at an increase in cost which has restricted their application to the more valuable spaces.

The principal lighting problems, when the overhead angle reflector method of illumination is adopted, are the determination of the proper location and the correct wattage of the

lamps in the reflectors. The location of the lamps may be determined from the following table:

Table No. 3—Lamp Spacing (Feet)		
Board Height	Distance Board to Lamp (P)	Distance Lamp to Lamp—Maximum* (S)
3	2	3
6	3½	5
8	4½	6½
10	5½	8
12	6	9
15	7	10½
20	9	13
30	12	18

The proper lamp size depends upon the district brightness and may be determined as follows:

First, determine the number of lighting units.

$$N = \frac{\text{Board Length}}{\text{Lamp-to-Lamp spacing}}$$

Then

$$\text{Lumens per lamp} = \frac{W \times H \times (80 - 5 \text{ D.B.})}{N}$$

where W is the width of the board in feet, H the height in feet, and D.B. is the district brightness factor (See Table No. 1). This will give the desirable lumen output from each lamp.

*This spacing distance may, of course, be made smaller in order to utilize the correct wattage, as determined from the district brightness on the board.

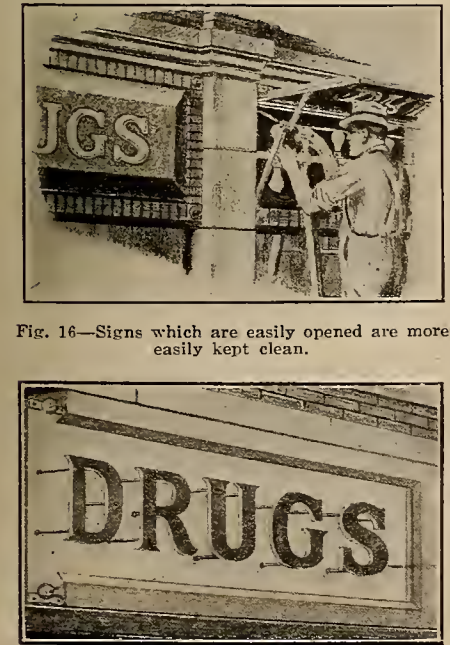


Fig. 16—Signs which are easily opened are more easily kept clean.

Fig. 17—The usual small silhouette sign consists of opaque letters mounted on pins in front of an illuminated background.

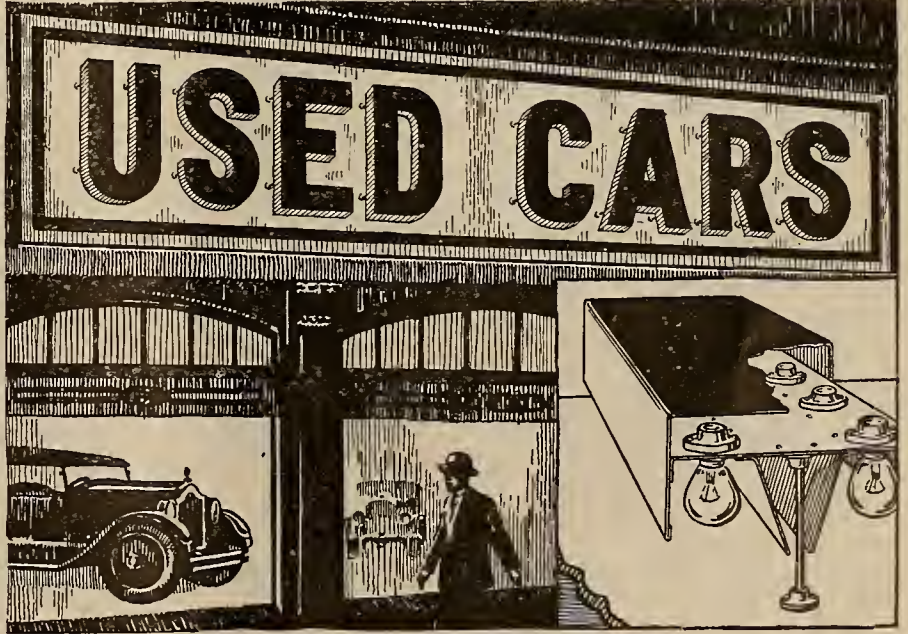


Fig. 18—Silhouette construction for large letters requires two lines of lamps following the outlines of the strokes of the letters. The effectiveness of this type of sign as well as its construction may be seen from the sketch.



Fig. 19—Silhouette construction for letters of a medium size requires a single line of lamps on the centers of the strokes.



Fig. 21—Distinction and beauty of design characterize this angle reflector without impairing its utility.

Select a lamp from the table below, the lumen output of which is nearest this value.

Table No. 4

Lamp Watts*	Approximate Lumens
50	500
75	900
100	1300
150	2200
200	3200
300	5000
500	9400

For large wall bulletins, floodlight projectors often offer the simplest installation as well as a pleasing one. The illumination from projectors should have the same general characteristics as that from angle reflectors except that the gradient in intensity from the top to the bottom of the board should not be so great, although even in this case the top of the board should be at least as brightly lighted and, if anything, more brightly lighted. The problems of selecting the right projectors and placing them, are identical for wall bulletins and for building displays. These are discussed in the next section.

* See note on page 459, Journal of Electricity, Dec. 15, 1925.

Spokane Dealer Puts in Line of Flowers.—An interesting experiment in the way of handling subsidiary lines is being tried by the Duncan Electric Company, Wall and Riverside Streets, Spokane, Wash. Charles Duncan, the owner, having some experience in flower culture, has included with his electrical contracting and merchandising business a line of cut flowers and plants. He hopes by this action to fill the valley in the volume of electrical merchandising business usually occurring after Christmas. If the two lines prove to be satisfactory store mates he will make the experiment permanent.

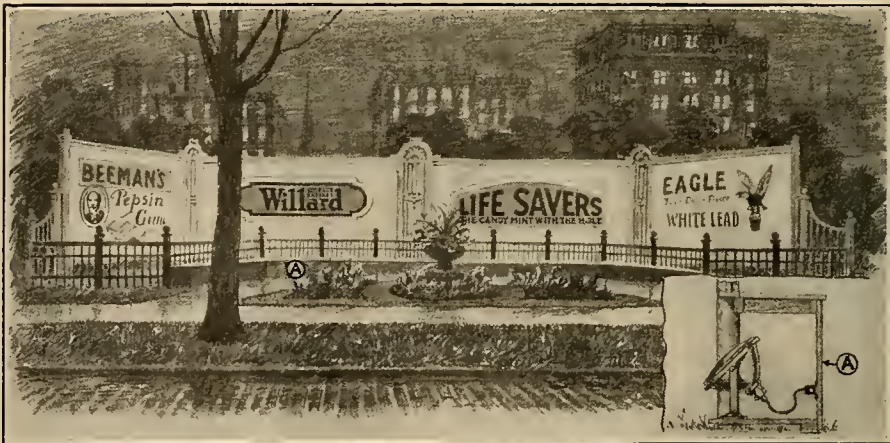


Fig. 20—By concealing floodlights in a trough and beautifying the area in front of poster panels and painted bulletins, the appearance can be made very attractive.

School for Apprentices Started in San Francisco

Industrial Association Is Operating a Training School Under Agreement with Electrical Contractors

Twenty boys have been enrolled in the apprenticeship school which is being conducted by the Industrial Association of San Francisco in line with an agreement with a number of the electrical contractors of the city. The class meets Monday and Wednesday nights from 7 to 9 p.m. and is instructed by Frederick Fisher of the Fisher Electric Company. After Feb. 1 it is planned to start an advanced class which will include all grades of helpers, with the exception of those having less than six months experience.

Under the agreement of the Industrial Association with the individual shops, each apprentice is to be started at the trade at a minimum of \$2 per day when he begins work in the shop. He is placed on a one-month probation period, during which the employer will not discharge the apprentice until the case is reviewed by the apprenticeship committee. At the completion of this period he is classified as a bona fide apprentice.

Advancement (if the apprentice is in good standing as approved by the apprenticeship committee) will be made on the minimum schedule at rate of \$.50 per day at the end of each six months of training, except after three years have expired at which time the apprentice is called a junior mechanic, if he qualifies by his practical work and the examination for that grade; and then he will be advanced at the rate of \$1.50 per day at the completion of the last two periods of six months. This schedule is based upon \$8 per day wage for all-around electricians and will be adjusted to any changes in the journeyman basis rate. An apprentice may be given advancement ahead of the schedule at the request of the employer when approved by the committee if the apprentice demonstrates exceptional ability.

All apprentices in training agree to attend school when called upon. Each must pass each course and examination for his grade before he is given advancement to the next grade. Each apprentice is registered, and his training card will be signed by his employer every six months. The employer agrees to give the apprentice the necessary

experience to enable him to become an all-round mechanic. The Industrial Association will act as a court of appeal in all cases of complaints. The apprentice agrees not to quit his job until the case is heard by the Industrial Association; and the employer will not discharge an apprentice until the case is heard by the apprenticeship committee. In special cases the apprentice may be transferred from one employer to another.

A fair proportion of apprentices to journeymen will be maintained in the shops under the agreement (not less than one bona fide apprentice to three journeymen).

The schedule of training will be developed and approved by the apprenticeship committee in co-operation with the Industrial Association. The apprentices are selected by the Industrial Association and approved by the apprenticeship committee. The committee will make a periodic check-up on the progress of the apprentices and the operation of the apprenticeship agreement, which is signed by both apprentices and contractors with the apprenticeship committee.

The apprentice receives a bonus of \$24 at the completion of each six months period of training in good standing if his attendance record shows better than 75 per cent and he passes the prescribed courses and examinations.

Class Instructed in Wiring Methods as Building Is Constructed.—Students in a class in electricity are receiving instruction in wiring methods as a manual training shop is being wired for the Dos Palos High School. J. E. Oust, Jr., proprietor of the Thor Electric Company, Merced, Calif., has the wiring contract on the building and he lectures to the class on various phases of the wiring as the building progresses. The regular instructor of the class and the students watch the work that is put in each day.

Ne Page McKenny Company, Seattle, Wash., has been awarded a contract for a street-lighting system in L.I.D. 4162.

Questions and Answers on the Code and Safety Orders

Arrangements have been made with Claude W. Mitchell, electrical engineer of the Board of Fire Underwriters of the Pacific, to answer through the columns of the Journal of Electricity such questions on the National Electrical Code as are of general interest.

Similar arrangements have been made with George E. Kimball, electrical engineer of the Industrial Accident Commission of the State of California, to answer questions on the Electrical Safety Orders issued by the Commission.

While it is the object of this department to assist in a better understanding of the Code and the Safety Orders, replies given are not to be considered as official interpretations applying in all instances, as some of the rules permit of varying interpretations under different conditions. The questioner should be guided by the inspection department having jurisdiction.

All who are interested are invited to send in their inquiries regarding the National Electrical Code to Claude W. Mitchell, Board of Fire Underwriters of the Pacific, Merchants Exchange Building, San Francisco, Calif., or to the Editor, Journal of Electricity, 883 Mission Street, San Francisco. Questions on the Safety Orders should be sent to George E. Kimball, Industrial Accident Commission, State Building, Civic Center, San Francisco, or to the Editor.

Q. Is it permissible to substitute BX for knob-and-tube construction in frame bungalows in places where knob-and-tube construction is permissible for this class of work?

A. There is no provision in the National Electrical Code to prevent such substitution, but it is not allowed by some local inspection departments.

Q. What size neutral wire would be required in the service supplying four 660-watt two-wire circuits?

A. Some local inspection departments require a 3-wire service for four circuits. The minimum size of service wire required would be No. 10 for both neutral and other service wires for either a two or a three-wire service supplying four 660-watt 110-volt circuits.

Q. Is it permissible to bring the neutrals of branch circuits together into a common ground?

A. The grounded conductor of an interior wiring system shall have but one grounding connection within the building. Under ordinary conditions this ground shall be made at the service on the line side of the service switch. Neutral wires of branch circuits shall not be brought together, but each neutral wire shall be fastened under its proper terminal in the panel board. Some panel boards approved and arranged for single-pole fusing have these terminals mounted on a common strip or bus which is connected to the neutral feed or service wire and then grounded through the service ground.

Distribution Center an Important Feature in Large Buildings

Although completed some time ago, the electrical installation in the Pacific Mutual Building in Los Angeles has many features of interest to electrical engineers and contractors. The distribution center with its dead-front and dead-back switchboard is finished in marble and tile. This is shown in Fig. 1-A. Fig. 1-B shows it in the course of construction. Note the heavy angle-iron and channel-iron supports attached to rods under the ceiling to support the conduit.

The feeders for this building are shown in Fig. 1-C; the substantial construction of the supports for double-decking the conduit is particularly interesting. The tunnel shown in Fig. 1-D extends under the street from the Pacific Mutual Building to the Pacific Finance Building, and contains the feeders for the latter building. Due to the heat, these 500,000-circ. mil. cables are run in the open tunnel supported on porcelain cleats.

The electrical installation in this building as well as in the Pacific Finance Building was made by the Golden State Electric Company, Inc., of Los Angeles. This company specializes in electrical installations in large buildings of this type. Paul Ehm, president of the company, stated that the contracts on these two buildings had been awarded to it without competition.



Fig 1. Distribution center and other electrical construction features in the Pacific Mutual Building in Los Angeles.

BETTER MERCHANDISING

In 1926 Make *Commercial Lighting* a Sales Builder

The Dealer, the Contractor, the Central Station, the Manufacturer,
and Especially the CUSTOMER, all Profit from the Sale of
Better Lighted Stores and Store Windows

Commercial Lighting Sold Like Kitchen Units

Central Station Puts on Program That Builds Load and Boosts
Wiring for Contractor as Well

Wholly in the nature of an experiment, although it was realized clearly after a general survey of the business district that there was room for a great improvement in the commercial lighting, The Washington Water Power Company, Spokane, conducted its first campaign on commercial lighting units between Sept. 22 and Nov. 7, 1925. The survey showed that there were 3,100 stores and shops in the territory served, and, while only 30 per cent were properly lighted, it was estimated that about 7 per cent of the total should be sold three units apiece, or a total of approximately 650 units.

The Ivanhoe No. 5243 direct lighting unit with lamp, glass and holder was selected as the especial offering of the campaign, and orders were placed for two sizes, 9 in. and 16 in., arranged for installation with either chain or ceiling flange, at the customer's option. In the 16-in. size a few fancy units were ordered, but all others were plain.

For two weeks before the campaign the ten city salesmen were coached carefully on the theory and application of commercial lighting so as to enable them to proceed in the actual selling with full confidence in their own ability to solve all but the more complicated problems. A series of talks was given by W. R. Mathews, illuminating engineer of the power company, who could anticipate by his own previous work in this field the difficulties that the salesmen were apt to encounter. Of the ten salesmen, only two were acquainted with the commercial work; the experience of the other eight had been confined to house-to-house work in the sales of domestic appliances, an entirely different problem.

The booklet, "Building Store Profit with Light," issued by The Society for Electrical Development, was distributed among the salesmen.

Arrangements were made with six contractor-dealers to perform the work of installation, together with any additional wiring agreed upon. Prices were made for the several sizes and styles of fixtures, including installation where no changes in wiring were necessary. The salesmen were instructed to make this point very clear to prospective customers and, in cases where additional work on wiring was required, to obtain the customer's permission to

have a contractor-dealer submit estimate of cost.

The general instructions given to the salesmen embodied the following points:

1926 Will Reward the Salesman

BY showing what others have accomplished in sales by explaining tried and proved methods of successful merchandising, by presenting original ideas from those who create sales ideas, by giving you concentrated, applicable sales information, the Journal of Electricity begins its 1926 New Year's Better Merchandising policy in this section. Here, on these pages, are told successful COMMERCIAL LIGHTING sales ideas and experiences. Likewise in each forthcoming issue will be found in this section concentrated, valuable suggestions on some one phase of electrical merchandising which you, as a dealer, may put into harness for your own good. The Journal invites your experience and advice to make this feature comprehensive and representative. And it counsels you to read well and utilize the best ideas of others as presented here in each issue. 1926 will richly reward the one who puts brains and energy into his sales effort.

1. Call upon customers during their slack periods.
2. Size up lighting equipment quickly but carefully.
3. Fill out data on survey card. (Fig. 1.)
4. If possible, make definite recommendation then and there as to size and number of new units.
5. Sell the idea of better lighting, overcoming objections based on cost of installation and operation by emphasizing advertising value and increase in sales due to good effects upon shoppers, and by showing what a very small proportion of the cost of doing business was represented by good lighting.
6. Give an estimate of total cost of installation, mentioning cash and term prices.
7. Get the order.
8. Fill out specification sheet. (Fig. 2.)

The salesmen were urged to make as many calls as possible in order to cover the ground in the allotted campaign

period and to waste no time in places where the lighting was fairly good. They were impressed with the desirability of having a large number of small shops properly lighted.

A liberal program of newspaper advertising was executed, and during the first part of campaign two circular letters were mailed to the prospects, explaining the service that was being rendered by the power company and preparing the prospect for the call that would soon be made by one of the salesmen. Return postals were enclosed with these letters, listing six stores that had been equipped previously with proper lighting equipment and were considered good examples, calculated to arouse interest.

It was agreed with customers that fixtures would be removed and price refunded if after suitable trial they were regarded as unsatisfactory.

The results of the campaign were as follows:

Total calls made—about 1,900 or 60 per cent of prospects.

Total installations, 208.

Total units sold, 578.

Total kw. installed, 187.

Increase in annual revenue, \$2,500.

The gross sales were approximately \$6,800, and the expenses were practically the same in amount.

Of the 187 kw. installed, it is estimated that 90 kw. represent the increase. In many cases one new 300-

SURVEY CARD	
Name of Co.	<input type="checkbox"/> Main Street
Address	<input type="checkbox"/> Side Street
Business	
Type of goods displayed	
Manager	Interested <input type="checkbox"/> Yes <input type="checkbox"/> No
Outdoor Lighted Sign?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Number of outlets	RECOMMENDATIONS
Type of fixtures	
Type and Size of Lamps	
Spotlight	Floodlight
Convenience Outlets	
BE ACCURATE	
<div style="border: 1px solid black; padding: 5px;"> Length ——— ft. Depth ——— ft. Height ——— ft. Remarks: </div>	<div style="border: 1px solid black; padding: 5px;"> Length ——— ft. Depth ——— ft. Height ——— ft. Remarks: </div>
Use blue pencil to outline Also indicate position	
windows on above layouts of all present fixtures	

Fig. 1. Both sides of the survey card filled out by salesmen on the customer's premises, and upon which much valuable sales data were collected.

The Washington Water Power Co.

SPECIFICATION SHEET

Interior Lighting

Name -----		Route -----		Folio -----	
Address -----					
Kind of Store -----					
Ceiling Height -----		Feet -----		Inches -----	
Color of Ceiling -----		Of Walls -----		Type of Ceiling Plaster ----- Metal ----- Wood ----- Concrete -----	
Type of Present Wiring:		State whether wiring is concealed or exposed?			
Knobs and Tube -----					
Conduit or Metal Molding -----					
Wood Molding -----		Width -----		Inches -----	
If additional wiring must be done, outlets moved or capped, state what is required and sketch location of new outlets on back of this sheet.					
Actual cost of wiring \$ -----		Bid by -----			
Are Wall Switches installed? -----					
How many Units will require Pendant Switches? -----					
Is Fixture Stud installed? -----					
Do not Answer Questions below. To be filled out in Office.					
Chain Suspension Hanger, Length in Inches -----					
Ceiling Flange, Size in Inches -----					
Glassware, Size -----		Plain -----		or Decorated -----	
Size of Lamp Recommended -----		Number -----		Watts -----	
Estimated Increased Wattage -----		Revenue per Month \$ -----			
Note remarks and unusual conditions and sketch store on reverse side.					

Fig. 2. Specification sheet upon which orders for the commercial lighting units were entered. Where wiring was to be done this sheet was useful in presenting the data to a contractor for an estimate of the cost of the installation.

watt unit replaced three or four 50-watt lamps, of which possibly only one would be used most of the time, hence the use of the new 300-watt unit would create a very material increase in energy consumption.

For additional wiring over and above the actual installation of fixtures, \$716.50 was expended by the customers among the contractor-dealers. This is not included in the cost of campaign as shown above, but amounts to about \$1.25 per unit installed.

Although the campaign resulted in no merchandising profit, it is felt that it was a pronounced success. The at-

tention of the local business men was attracted to the importance of proper illumination and to the fact that the power company has a distinct service to offer in that field. Since the campaign a large number of orders has been obtained, the initiative having been taken by the customers. The electrical contractor-dealers were enabled to perceive the possibilities of business in store and factory lighting, and several have been taking active steps to stir up new business.

The prices per unit were as follows, including installation, and either chain or ceiling flange.

16-in. unit—Plain	\$12.00 cash,	\$13.00 terms—	\$4.00 down and	\$3.00 per month
16-in. unit—Fancy	14.00 cash,	15.00 terms—	4.00 down and	3.00 per month
9-in. unit—Plain	6.75 cash,	7.50 terms—	2.00 down and	1.50 per month

Pendant switch was included, if desired by customer, at an extra charge of \$1.

If He's Perfectly Satisfied

Many merchants with really poor lighting in their establishments are quite satisfied that their lighting is wholly adequate. The reason is that they do not know of anything better in lighting. The fact that their stores

may be less attractive, their windows less valuable because of poor illumination does not occur to them. They attribute poor business to "hard times," location, salespersons, to anything rather than lighting. With such merchants it is often impossible to sell im-

proved lighting for the entire establishment all at once. But few merchants will refuse to make a test in one particular window, or one particular department, to try the idea out, especially if the installation can be handled co-operatively with him as to the cost of the demonstration. Once that demonstration is made, light will sell the rest of the job. Make a demonstration your entering wedge. It seldom fails if it is a good demonstration.

Where "Daylight" Windows Have Brought Results

The value of afternoon show-window lighting, both from the viewpoint of the merchant and that of the central station, was demonstrated effectively by the Utah Power & Light Company during the month of December.

The idea was brought to the attention of its commercial flat-rate window lighting customers in Salt Lake City by the power company by means of a letter inviting attention to the fact that the greatest number of shoppers are on the streets during the afternoon hours. Particularly during the holiday season, the letter stated, when windows are at their best and the skies are usually cloudy, illumination earlier in the day will add to the attractiveness of the display.

In order to provide this afternoon lighting service a schedule was arranged under which show window lights could be turned on at one o'clock p.m. instead of the regular hour at dusk. A card was enclosed showing the amount the customer was paying for flat-rate window lighting and the additional charge if afternoon service was desired for a 30-day period. The company's services also were offered in the handling of specific problems which the customer might have in regard to window lighting, such as color lighting and special decorative features. Approximately twenty-five per cent of the company's customers of this class in Salt Lake City adopted this service during the month of December, representing almost every kind of downtown merchandising business.

The company derived additional revenue of approximately \$9.60 per customer for the month from this class of business.

Favorable comments were received from a number of these customers as to their opinion of the value of such lighting, and its use undoubtedly will be even more extensive and cover longer periods as a result of this satisfactory experience.

Show Red Man How Modern Home Is Vacuum Cleaned

When Indians gathered from all states of the Pacific Northwest to attend a general conclave at Spokane, Wash., held in conjunction with a civic Hallowe'en celebration there, the Eureka Vacuum Cleaner Company sales agency staged two exploitations contrasting the historic features of the Indians with modern living methods of 1925. Under the leadership of R. B. Carter, district manager, five motor trucks loaded with a carload of Eureka vacuum cleaners to be sold in the Spokane territory in December were paraded and later posed before the picturesque tepees of the Blackfoot In-



The Eureka Vacuum Cleaner Company's float in the memorable Hallowe'en parade at Spokane, in which the dusky squaw and her children were contrasted with the modern housewife who enjoys electric service in her home.

dians which were erected in the center parking strip of the downtown streets. In the Hallowe'en parade the Eureka float contained a squaw and two Indian youngsters standing near a giant cleaner built for exhibition purposes.

In December, 1924, the Eureka agency

in Spokane sold 1,240 cleaners in its territory, and this load of 1,000 cleaners was a part of the December sales last year handled by The Washington Water Power Company in the Spokane territory and by other dealers in Mr. Carter's district.

Elaborate Lighting as Business Getter Is Tested

New Clothing Store, Spokane, Is Proving That Illumination Is Basis of All Retail Store Advertising

By W. R. MATHEWS, Illuminating Engineer, The Washington Water Power Company, Spokane.

Advertising itself as the "Best Lighted Store in the Northwest," the new Fogelquist Men's Store, Sprague Avenue and Howard Street, Spokane, recently has started out to prove that good illumination is the best kind of advertising for a store of this kind. This was the basis on which the illumination was sold to Mr. Fogelquist by The Washington Water Power Company, and the few weeks trial that the installation has had seems to indicate a thorough success for the undertaking. The installation, completed as it was at the commencement of the first comprehensive commercial lighting campaign this company ever attempted, is used by the lighting salesmen as a model of the practically ideal store-lighting job, and has been responsible for many sales of improved store lighting in the campaign now in progress.

The store occupies both floors of a new two-story building, 40 x 60 ft. The lower floor, occupied by the haberdashery department, is lighted by thirteen 300-watt lamps in chain-pendant safety hangers with bronze finish, and enclosed within Ivanhoe 16-in. Genco glass. These are spaced with regard to the counters, which extend around three sides of the room, and are suspended 10 ft. from the floor so as to give an approximately uniform inten-

sity of 15 foot-candles on the merchandise. The second floor, housing the clothing department, is lighted by twelve 500-watt lamps enclosed within the same glassware suspended from ceiling flanges of the same design and finish as the pendant fixtures downstairs, and a like average intensity of 15 foot-candles is secured in this installation. In addition there is over each of the three mirrors a daylight unit Ivanhoe Trutint, consisting of a clear lamp with special lens and reflector to give accurate color determination.

Perhaps the most spectacular feature of the store illumination is that of the windows, in which an intensity of about 200 foot-candles can be secured. Forty-four 500-watt lamps are placed in X-Ray reflectors spaced on 18 to 22-in. centers, and these lamps and reflectors are hidden behind diffusing glass panes which form a ceiling to the window. This gives a wattage of 60 to 100 per sq. ft. of window floor area, and more than 250 watts per linear foot of glass. The windows are from 4 to 4½ ft. deep and are equipped with reversible backgrounds, one side of which is finished in a light gray tint, and the other in a dark mahogany. The light finish is used when dark goods predominate in the display, which, generally speaking, will prevail

in fall and winter. With this background only one-half of the total wattage of the window lights is required. In the spring and summer when straw hats and light fabrics are on display the mahogany backgrounds will be used, and the full wattage will be necessary.

A feature of this window-lighting installation which makes it, on account of its load factor, a particularly desirable load from the standpoint of the power company, is that the lights are burned in the daytime to counteract the effect of the sunlight or ordinary daylight reflected by the window panes into the eyes of spectators. On bright days all the wattage is necessary to accomplish this purpose, while on dull, gray days only one-half is used. Again speaking generally, this means that here is a steady load of either one-half or full wattage used 14 or 15 hours a day the year round, with full wattage utilization occurring in the summer when normal curtailment of light reduces the lighting peak. In other words, a sufficient load of this character would tend to equalize the summer and winter lighting peaks on the system.

The second-floor windows also are utilized for display purposes, and at night are blocked off at a depth of 2½ ft. by drawing a gold cloth curtain. They are lighted by a combination of foot and overhead lights, the foot-lights being 150-watt lamps in Pittsburgh reflectors, spaced on 18-in. centers, while overhead are 15 X-Ray spotlights spaced to play on one piece of merchandise each.

The front also is illuminated spectacularly. Two groups, each of eight 500-watt floodlights, located across the street are so circuited on an ordinary sign flasher that each group flashes on and off alternately with no dark interval—one group equipped with clear lenses and the other with red. The alternate play of red and white light on the gold lettering of the store front produces an effect on the eye of the passerby irresistible in that it commands attention. Plans for additional outside lighting include the installation of a luminous glass-lettered sign to extend around the face of the window above the valances, and also an electric sign placed diagonally across the sidewalk on the corner, readable from all four directions.

The Fogelquist store is an old institution in Spokane that had not been particularly successful in its former location where it carried a grade of medium and low-priced merchandise. In moving to the new location the store changed its policy in this respect and now carries the best that can be procured. It is interesting to note that the window-lighting operating cost has been increased ten times, and the interior lighting twice, over the cost in the old location. The principal intention is to make the new store so fine in appearance that it cannot help but be noticed by everyone so that every shopper will know where Fogelquist's is and what it carries. Thus the store will be in a position to cash in on any kind of advertising campaign it attempts, which was not the case in its old location where advertising campaigns produced mediocre results at best. Thus, in the opinion of this merchant, illumination becomes the one essential basis of all retail store advertising.

EVEN property values were enhanced in the neighborhood when the Fogelquist Men's Store of Spokane opened, advertised as the "best lighted store in the Northwest." (1) Spectacular illumination of the store windows where an intensity of 200 foot-candles is secured. The lamps and reflectors are hidden behind glass diffusing panes making up the window ceiling. These windows are lighted during daytime to counteract reflections. (2) The main floor where a uniform intensity of 15 foot-candles is maintained. Here the merchandise displayed is shown off to best possible advantage. (3) The second floor clothing department is featured by the installation of a daylight unit over each of the mirrors.



NEWS OF THE INDUSTRY

Six States Only Needed for New Swing-Johnson Bill

Introduction of a new Swing-Johnson Bill, which would require ratification by six of the seven states of the basin to make it effective, the attempt to remove jurisdiction of the Colorado River from the Federal Power Commission, and California's efforts to bring about agreement on the allocation of waters from the river, marked the three Colorado River settlement attempts before the Senate and Congress at last reports.

Other material changes have been made in the new Swing-Johnson Bill. Half of the capital obligation must be repaid within five years, while four per cent interest is to be paid on the remainder, which is to be repaid, together with all operation and maintenance charges, within fifty years.

The provision for 20,000,000 acre-ft. of storage would mean a lower dam than that recommended in the report made to the Reclamation Service. The dam proposed in that report was to be 605 ft. high and provide 34,000,000 acre-ft. of storage.

The bill provides an authorization for \$70,000,000, the same amount carried in the former measure.

Friends of the Water Power Act, on the other hand, are alarmed by the unanimous action of the Senate in suspending until Feb. 1, 1928, the "jurisdiction, power and authority of the Federal Power Commission to issue licenses for the purpose of constructing, operating and maintaining dams or reservoirs on the Colorado River and its tributaries." It is expected that similar legislation will be introduced suspending the operation of the Water Power Act on the Tennessee and on the Columbia.

The effect of such legislation, it is contended, is to suspend the public safeguards of the act and pave the way for the surrender of national rights or for gifts of public property.

In the case of the Colorado River, the public lands committee on one day reported favorably on a joint resolution, introduced by Senator Pittman of Nevada, and the next day passed the resolution by unanimous consent. Not an inquiry as to the effect of the action was made by any member when this far-reaching legislation came before the Senate. Senator Pittman urged the passage of the measure so that no state could obtain an advantage on the Colorado River pending the ratification of the Colorado River compact. He expressed the opinion that Arizona is encouraged to stay out of the compact which the six other states have ratified "by reason of the hope of obtaining through the Federal Power Commission the rights to build dams within the State of Arizona without regard to the effect it may have upon the rights of other states."

Since the Senate acted before any opportunity was afforded to hear from the commission it is expected that the real

consideration of this matter will take place in the House of Representatives.

It is not improbable that an effort will be made in the house to amend the resolution so as to make it cover the Boulder Canyon dam as well. If this is done it is predicted the measure will lose the support of the public-ownership group.

Meanwhile California's efforts to bring about an agreement as to the disposition among the lower states of the Colorado River basin of the 7,500,000 acre-ft. of water which passes Lee's Ferry have revealed wide differences of opinion as to the allocation.

California, which contributes no water to the river and which has only a few square miles in the drainage basin, wants recognition of 2,146,000 acres of perfected rights and to a diversion of 1,095,000 acre-ft. for use by Los Angeles. California would allocate 300,000 acre-ft. to Nevada and 500,000 acre-ft. to Mexico. When all these amounts are added together a total of 4,273,000 acre-ft. is obtained. This would leave 3,227,000 acre-ft. of the total passing Lee's Ferry. This amount California would divide equally between herself and Arizona. This, added to the amount mentioned, would give Arizona 1,845,500 acre-ft. and California 4,854,500 acre-ft.

The Arizona committee figures differently. Under its plan California would receive but 3,350,000 acre-ft. Arizona agrees to the 300,000 acre-ft. for Nevada and the 500,000 acre-ft. for Mexico which, when deducted from the 7,500,000, leaves 6,700,000 acre-ft. This the committee proposes to divide equally between the two states, or 3,350,000 acre-ft. each. In addition, Arizona reserves for herself the waters of her own rivers which add 2,563,000 acre-ft. to the Colorado River total. A considerable part of this latter total cannot be utilized, due to the wide variation in the discharge of the Arizona rivers.

To Commence Work of Lighting Salt Lake Air Mail Field

Authority to commence work immediately on the lighting of the Salt Lake City air mail field, as a part of the lighting system now being installed on the Salt Lake to Rock Springs air route to enable night flying between these two points, has been granted officially by the general superintendent.

Included in the lighting plan of the Salt Lake field is one of the largest floodlights in the country—a 36-in. arc light of 200,000,000 candlepower, which will be used in giving the "daylight perspective" to the entire field. In addition to this, there will be a 24-in. incandescent beacon light of 5,000,000 candlepower and a number of boundary lights to mark the rim of the field and the byways. The plan also calls for red obstacle lights which will indicate all objects to be avoided by the pilots in landing.

Herminghaus Case Draws Protest from Irrigation Interests

Claiming that a decision either for or against the Southern California Edison Company in the appealed Herminghaus injunction suit against the former, preventing the power company from storing riparian water, irrigation interests said to represent 94 per cent of the irrigated lands of the state have filed briefs with the California supreme court asking the rejection of the injunction and demanding that the Edison company not be allowed to store riparian water but only such water as it can appropriate.

The case in question is one which was tried in the superior court of Fresno county. (See Journal of Electricity, March 1, 1925, p. 185.) It was brought against the Southern California Edison Company by the Herminghaus heirs, and a decision was handed down Feb. 13, 1925, in favor of the plaintiff. This decision enjoins the Edison company from storing water in Huntington Lake on its Big Creek hydroelectric project except that which is produced by the run-off in the Huntington Lake basin.

Hearing before the state supreme court on the Edison company's immediate filing of notice of appeal is set for Jan. 15, 1926, the state supreme court sitting en banc for the case in San Francisco.

To protect their interests the irrigatists filed briefs with the court contending that the Herminghaus-Edison case involves only 6 per cent of the state's lands, but that if either party wins in the supreme court approximately half of the remaining state's lands' right to water will be jeopardized or destroyed.

Joining in these briefs against both parties are the United States Reclamation Bureau, the Irrigation District Association of California, certain San Joaquin Valley irrigation districts interested in the Pine Flat project, the State of California, the department of public works of California, the state division of engineering and irrigation, the state division of water rights, W. F. McClure, director of public works, and Edward Hyatt, Jr., chief of the division of water rights.

Utah Company Buys Vernal Hydro Plant and System

The hydroelectric plant and distribution system of the Vernal Light Company at Vernal, Utah, has been purchased by the Utah Power & Light Company. The plant, which is located on Ashley Creek, serves in the neighborhood of 600 customers. The city council of Vernal has granted to the Utah Power & Light Company a fifty-year franchise.

A number of improvements and additions to the present plant and system are contemplated for the near future.

Western Electric Supply Separated and Incorporated as "Graybar"

With the distinction of being even one year older than the parent organization, the San Francisco branch of the re-named Graybar Electric Company, formerly known as the Supply Department of the Western Electric Company, holds the distinction of many pioneer achievements in the early history of electrical development, for which the Gray & Barton firm is itself noted in the East. The San Francisco branch was formerly the California Electrical Works; it was founded as far back as 1868 and reorganized in 1877. The Gray & Barton Company, later becoming the Western Electric Company, was founded in 1869.

These facts came to light with the historical data revived in connection with the separation of the electrical supply business carried on by the Western Electric Company from the telephone manufacturing business and its incorporation under the new, yet original, name of the firm, "Graybar," a contraction of the names, Gray and Barton, the founders of the Western Electric Company. This separation was announced late in December (see Journal of Electricity, Jan. 1, 1926, p. 32), the renaming becoming effective Jan. 1.

The San Francisco branch had the added distinction of participating in the installation of the first successful hotel electric annunciator, of the first multiple-call district telegraph box, of the first control station for light and power, and of the first electrical illumination for a theater. It was purchased, as the California Electrical Works, by the Western Electric Company in 1902 and became Pacific Coast headquarters. Later branches were opened in Oakland, Los Angeles, Seattle, Portland, Tacoma and Spokane.

The Western Electric Company lays claim to being the largest merchandiser of electrical supplies in the world, and the same claim is being made for the newly named organization as well. It has 55 distributing houses located in centers of business in various parts of the country.

The Western Electric Company has been both the manufacturing department of the Bell System and a merchandiser of electrical supplies. Since telephone manufacture and the distributing of electrical supplies are two distinct lines of business, each requiring specialized organization and specialized management, the physical separation of the two was decided upon and carried to completion in 1923. The rapid expansion of this department, and the importance of establishing for it an identity apart from telephone manufacturing, with which it is not involved, now has led to the incorporation of the business under the name, Graybar Electric Company.

The name of the new concern is derived from that of Gray and Barton, the partnership formed between Professor Elisha Gray and Enos M. Barton in 1869 for the purpose of manufacturing electrical equipment. The small shop of Gray & Barton, whose chief activity was the making of telegraph apparatus, fire alarm apparatus, and burglar alarms, developed into the Western Electric Company, manufacturer of most of the world's telephones. A \$400 mortgage on his mother's house enabled

Enos M. Barton to enter into this partnership. He had been a student of electricity and a telegraph operator.

Elisha Gray was a professor at Oberlin and an inventor whose devices became one of the firm's principal assets.

It is believed that this is the first instance in business history where a corporation after such a lapse of time and a period of such tremendous growth has reverted to its original designation as a basis for its corporate name.

The new company handles a wide variety of apparatus and supplies. Apparatus such as motors, generators, electric lamps, industrial and other lighting equipment, household appliances, and the like, formerly sold under the Western Electric name, now will be



ALBERT LINCOLN SALT

sold under the trade name "Graybar." The new company will be concerned with radio through its sale of broadcasting equipment and other radio telephone equipment which the Western Electric Company manufactures. Other supplies entering into the Graybar business are poles, pole line equipment, wire, cables, and accessories for electrical contractors and dealers.

The distributing organization with its fifty-five local branches represents the growth of many years and will not be affected by the change of name from Western Electric to Graybar. The purpose of these distributing houses has been to extend and improve the facilities available to buyers of electrical supplies. Edward J. Wallis is the Pacific Coast manager. William S. Berry is the manager of the San Francisco and Oakland houses, of which A. H.

Nicoll is sales manager, L. J. Brown stores manager, and John Bray credit manager. Joseph Miserez is sales manager in direct charge of the Oakland branch.

At the other Pacific Coast offices of the Graybar Electric Company the same personnel will remain. H. L. Harper is manager of the Los Angeles branch. J. I. Caldwell is manager of the Seattle branch, and S. G. Ward manager of the Portland branch. J. P. Carson is sales manager for Graybar in Spokane, and V. E. McCain sales manager in Tacoma.

In the Intermountain territory A. C. Cornell is manager of Graybar Electric Company in Denver, with J. M. Perlewitz sales manager in Salt Lake City.

The board of directors of the parent Graybar company consists of Albert Lincoln Salt, president; Frank A. Ketcham, executive vice-president; George E. Cullinan, vice-president in charge of sales; Leo M. Dunn, vice-president in charge of merchandising and accounting, and the following executives of the Western Electric Company: chairman—Charles G. Du Bois, chairman of the board of directors and president; Richard H. Gregory, director and comptroller; Howard A. Halligan, director and vice-president; George C. Pratt, general attorney and secretary, and William P. Sidley, director, vice-president and general counsel.

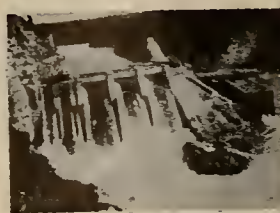
Bank Sends Power Company Mail Stuffer to Eastern Clients

A new plan of distribution of advertising literature to attract industries to the site of low-cost power was developed at Spokane, Wash., where The Washington Water Power Company supplied a "stuffer" card to the Spokane & Eastern Trust Company of that city. This card will be included in all Eastern mail of the bank going to banking connections in other states.

The card is headed: "Low-Cost Power Invites Industry to Spokane." It cites the wide diversity of uses of electricity in the "Inland Empire" and contains an excellent photograph of the Long Lake power station of that company.

Power Line to Be Extended to Irrigation Experiment Station.—The Pacific Power & Light Company immediately will construct an extension of its service lines from Prosser, Wash., to the Irrigation Experiment Station, one and a half miles distant. The extension will give the station buildings current for both lighting and motor service.

Low-Cost Power Invites Industry to Spokane.



Long Lake Dam and Power Station on the Spokane River

Four generators have an installed capacity of 94,000 h. p.

WATER FALLS drew the early settlers to the present site of the City of Spokane. These same falls, harnessed by this Electric Service company, supply an abundance of dependable electric light and power to the life and industry of this diversified district in the heart of the Pacific Northwest. Power is delivered by us at low cost to the mines of the noted Coeur d'Alene district in Idaho, the transcontinental railroad of the Chicago, Milwaukee & St. Paul system and to the factories, orchards, farms and homes of this district. This same power is an important factor to the lumber and clay products industries adjacent to this city.

Seven hydro-electric stations, which have a total installed generating capacity of 187,300 horsepower, feed into a network of transmission and service lines in the sixteen counties of eastern Washington and northern Idaho which we serve. This Electric Service company stands ready at all times to serve the largest industry or the smallest home erected within its territory.

THE WASHINGTON WATER POWER CO

THE SPOKANE & EASTERN TRUST CO. TAKES PLEASURE IN PRESENTING THIS CARD TO YOU FROM ONE OF ITS VALUED DEPOSITORS.

Mail stuffer provided by a power company for a bank to use in its mail to Eastern firms, advertising the low power cost in that community and inviting industries.

Personnel Changes Announced by Great Western Company

Changes in personnel recently announced by the Great Western Power Company of California include the appointment of H. E. Brillhart as manager of the Sacramento division, effective Jan. 1. Mr. Brillhart has been in the employ of the company for several years, and comes from Napa where he was in charge of the Northwestern division, which includes the Napa, Santa Rosa and Petaluma districts. J. W. Anderson, formerly district sales manager at Sacramento, succeeds Mr. Brillhart as manager of the Northwestern division with headquarters at Napa.

George B. Sanford, for many years in charge of the company's affairs at Sacramento, has been transferred to the right-of-way and claims department, reporting to the general office at San Francisco.

Marvin Curtis, Jr., formerly sales manager in the company's San Francisco division, has been made manager of the Rio Vista district, which takes in the territory from Clarksburg south to Antioch, Calif.

Stimulating Activity Among Coast Mazda Lamp Dealers

Working in co-operation with a number of supply jobbers handling National Mazda lamps on the Pacific Coast, members of the Pacific Lamp Division of the National Lamp Works of Oakland, Calif., together with a representative of the publicity department of the National Lamp Works of Cleveland, Ohio, recently made a tour of the principal cities on the Pacific Coast, in which they conducted twenty-one meetings and delivered a "Better Merchandising" story to approximately 1,800 lamp merchandisers.

Their program followed a dinner given by the jobber to his dealer agents, and consisted first of the showing of two reels of motion pictures. The first one presented pictures of Nela Park activities, including scenes of the Nela School of Lighting, lamp development laboratories, and lighting research departments; the second was a reel showing modern Mazda lamp-making. This was followed by a discussion of the new standard line of in-

side frosted Mazda lamps, of which the 25 and 100-watt sizes already have been made available to the trade.

The second part of the program was a talk on merchandising and advertising through the merchants' show windows, with a demonstration of show-window lighting. A complete portable show window was used for this purpose. Clark Baker covered this subject in a very complete and interesting way.

The third part of the program was a two-act playlet entitled, "Stepping It Up," depicting in a humorous, interesting, and instructive manner the high spots of electrical merchandising, especially as applying to lamps and lighting. The leading roles in this playlet were taken by G. R. Lawall, who took the part of the electrical dealer, and Clark Baker, who assumed the roll of jobber's salesman.

A. M. Sweeney, manager of the Pacific Division, National Lamp Works, was in charge of the tour. Those accompanying and assisting him in the program were G. R. Lawall, publicity department, National Lamp Works of Cleveland; Clark Baker and Douglas Ryan of the Oakland office of the Pacific Division, National Lamp Works; J. W. Cushman, Los Angeles branch manager; F. U. Bliss, Northwest branch manager.

Mountain States Light and Power Companies Form Merger

Consolidation of a number of electric light and power companies in Utah, Wyoming, Montana and South Dakota, under the newly formed Midwestern Power Company, was announced recently. Utah, Wyoming and Chicago capital is backing the enterprise, and it is stated that the company plans to extend its operations into other western states. The properties owned at present, or under contract for immediate purchase, serve Greycliff, Worland, Riverton, Hudson and Yoder, Wyo.; Edgemont, S. D., and Baker and Forsyth, Mont., and adjacent sections.

Officials and directors of the company are: president—H. B. Waters, of Salt Lake; vice-president—E. P. Bacon, of Casper, Wyo., and formerly of Salt Lake; secretary and attorney, H. R. Waldo, of Salt Lake. H. C. Chappell,

of Casper, E. B. Palmer, of the Palmer Bond & Mortgage Company of Salt Lake, and R. E. Wilsey, president of the R. E. Wilsey Company, a Chicago investment banking house, are among the directors.

Puget Sound Company Negotiates for Steilacoom System

Negotiations are now under way between the city of Steilacoom, near Tacoma, Wash., and the Puget Sound Power & Light Company which, if consummated, will result in sale of the entire electric distribution system of the city to the power company. The Steilacoom city council has accepted tentatively the power company's offer for the distribution system, with the reservation that sanction to complete negotiations must be given by the voters of the city. Steilacoom voters will be called upon soon to express their views with regard to the proposed transfer.

The electric distribution system has been owned by the city of Steilacoom for a number of years. However, the council now feels that it is no longer desirable or economical for the city to continue to operate the system. The Puget Sound Power & Light Company, it is understood, has agreed to provide additional facilities and service to cope with growing demands of the community, should the deal be consummated.

Arizona Edison Company Buys Ice Plant at Florence

The Arizona Edison Company has purchased the ice and cold storage plant at Florence, Ariz., and is reported willing to take over the municipal light and power plant of that city. Current is obtained from the hydroelectric system of the Salt River Valley Water Users' Association, which also furnishes power for pumping large areas around Florence and Casa Grande. This electric service may be extended along the Southern Pacific lines from Casa Grande to Tucson where cheaper and better power is needed for agricultural needs.

The Arizona Edison Company already has bought the public utility plants at Bisbee, Douglas and Yuma.

Irrigation District Cannot Use Funds to Help Pass Bill

An opinion filed by Judge Walter Guerin of the Superior Court at El Centro, Calif., Dec. 26, stated that the payment of funds from the treasury of Imperial Irrigation District to promote passage of the Swing-Johnson bill is illegal. This decision was rendered in a test case brought by D. R. Crawford over the employment of Col. B. F. Fly of Yuma to go to Washington on behalf of the Boulder Canyon project.

An appeal probably will be taken, and it is expected that a number of municipalities will join in the fight to have Judge Guerin's decision overruled in the higher courts. Charles L. Childers, attorney for the Imperial Irrigation District, complained that if the higher court finally should approve Judge Guerin's decision, "no district or city could legally spend so much as the price of a postage stamp" to write to a congressman or a state legislator for the passage or defeat of a bill.



Dealer meeting of the Electric Appliance Company, San Francisco, which was typical of the meetings given by various jobbers to their dealer agents in connection with the stimulating activity of the National Lamp Works of Oakland, Calif.

Company's Rate Base Valuation in Washington Reduced

Marking a step in the proceedings of the rate case of Walla Walla and other Washington cities against the Pacific Power & Light Company, Portland, the Washington Department of Public Works has issued a valuation order reducing the rate base valuation of that company's properties serving Walla Walla and the Yakima Valley by \$1,137,244. This order is the outcome of the hearing held in Walla Walla, in August, 1925 (*Journal of Electricity*, Oct. 1, 1925, p. 264), at which evidence was presented tending to show that certain properties of the company were no longer used and useful in the operation of its Yakima-Walla Walla power system.

The largest item of reduction as listed in the recent order is an amount of \$873,922, said to be the value of the Oregon properties included in the Washington rate base. This amount covers the value of the Walla Walla River hydroelectric plant with transmission lines and other appurtenances. The second item is an amount of \$204,519 by which, the order states, the value of the Fruitvale plant should be reduced in order to bring the value of that plant down to a reasonable amount per kw. of generating capacity. Other items making up the total reduction include the entire value of the Kennewick steam plant, \$45,195, and of the Pomeroy steam plant, \$13,608, these properties being listed as no longer used and useful. Notwithstanding these reductions, the order finds that the company earned in 1924 only 7.66 per cent net on the new base.

The company, it is understood, will bring suit in the Superior Court of the state to have the findings of the order reviewed. The company has contended throughout the proceedings that an entirely new appraisal should be made to establish beyond question the actual value, for rate making purposes, of the useful properties involved.

An interesting sidelight to the case is found in the introduction to the present legislature of the state of Washington of a bill appropriating \$20,000 to reimburse the cities and towns of the district for expenses incurred by them in the preparation and presentation of evidence and in the prosecution of the case.

Action of House Foreshadows the Passage of Trunkey Bill

Passage of the Trunkey Bill, now before the state legislature of Washington in session at Olympia, is foreshadowed by the action of the house which, through a vote of 44 to 27, defeated an amendment offered by Mr. Jacobs of Pierce County that would have exempted the city light and power plants from the general provisions of the bill. Motions to table also were defeated.

The Trunkey Bill would compel the city of Seattle to hold new elections before issuing bonds for additional units of the Skagit power project. (*Journal of Electricity*, Jan. 1, p. 31.) The general provisions of the bill are that any utility bond issue for a municipally owned utility, in addition to all other requirements, must be submitted to vote of the people if the bonds are to provide for a new plant or a new unit.

Power Project Planned for West Slope of Cascade Range

Perfecting the company's titles to smaller operations started as far back as 1913, and opening the way for an expansion project that calls for two plants involving expenditures of \$505,000, four water permits for the Sultan Electric Company, Sultan, Wash., on the west slope of the Cascade Range, were issued late in December by R. K. Tiffany, state supervisor of hydraulics. The applications have been under advisement since last July.

To be known as the Lake Isabel watershed, the larger of the two units will store 10,000 acre-ft. of water. Appropriation of 6 sec.-ft. of water from McCoy Creek and another stream leading from Tomtit and Roensiger Lakes also is authorized. The second reservoir, also located within a few miles of Sultan, will store 800 acre-ft. In conjunction with this reservoir is the authorization for the appropriation of 25 sec.-ft. of water from May Creek, a tributary of the Wallace River.

Purchasing and Stores P.C.E.A. Sets Meeting Date

The Purchasing and Stores Section of the Pacific Coast Electrical Association has set the date of its first meeting as Jan. 22-23, at the offices of the Los Angeles Gas and Electric Corporation, 810 South Flower Street, Los Angeles, Calif., according to a late announcement made by Frank W. Smith, Great Western Power Company, chairman of the section.

To Hold Division Managers' Meeting.—Allied Industries, Inc., San Francisco, will hold a meeting of its division managers in that city Jan. 18-21. The conference will be attended by division managers from Seattle, Portland, Los Angeles and Oakland.

Hurley Company Reorganizes and Changes Company Name

To be known as the Electric Household Utilities Corporation, and making changes in its authorized capital, as well as extensive changes in its personnel, the Hurley Machine Company, according to J. W. Ferry, manager, Pacific Coast division, intends to launch a business expansion program of considerable magnitude.

The change of officials of Hurley Machine Company, as authorized by the directors, included the election of S. D. Heed as president. Neil C. Hurley, who has been president of the company for twenty years, became chairman of the board, while Edward N. Hurley, previously chairman, became chairman of the executive committee.

The members of the board of directors are, in addition to those serving on the executive committee, Joseph E. Otis, Silas H. Strawn, Alva J. Fisher, N. R. Birge and S. D. Heed.

A special meeting of the stockholders of the company was called to convene on Dec. 28 for the purpose of acting on the question of changing the name of the company from Hurley Machine Company to Electric Household Utilities Corporation, and of changing the authorized capital of the company from 300,000 shares of no par value to 600,000 shares of the par value of \$10 each.

Grays Harbor Company Insures Employees.—Adoption of a plan of insuring all of its employees that has been under consideration for some time by the Grays Harbor Railway & Light Company, Aberdeen, Wash., was put into effect by that concern on Jan. 1. Under the agreement each of the company's 130 employees has been insured. Age does not affect the insured except that the cost to the company is higher in the case of older employees.

Northwest Electric Light & Power Association

Set Meeting Date for Northwest Technical Section

The third annual general meeting of the Technical Section of the Northwest Electric Light and Power Association is to be held March 11-12 at Seattle, the meeting place to be designated later by the committee on arrangements.

The meeting will take the same general form as the former general meetings of the section in which each committee is allotted a certain time for the presentation for discussion of subjects pertinent to its work.

Two papers of particular general interest scheduled at this time are a paper on the economies of safety work, as part of the program of the accident prevention committee, and a talk by a utility executive, as yet not definitely designated, on the desirability of public relations instruction among engineers and construction men. Invitations to address the meeting have been extended to C. F. Hirshfeld, chairman of the Technical National Section, Col. William Kelly, director of engineering, N.E.L.A., and A. Jackson Marshall, secretary, Na-

tional Electric Light Association. These men have signified their intentions of attending.

The meeting is to be open to all interested persons, whether members of the Technical Section or not.

First of a Series of Talks by Utility Executives Given

As a part of the program of the committee on co-operation with educational institutions, Public Relations Section, the first of a series of talks to be given by utility executives at Washington State College, Pullman, and University of Idaho, Moscow, was delivered Dec. 16, 1925, by L. A. McArthur, vice-president and general manager, Pacific Power & Light Company, Portland. Mr. McArthur's subject was, "Some Economic Aspects of Public Utilities," and he presented it to students in electrical engineering and business administration at both institutions.

This talk is to be followed by others on different phases of the utility business by other executives of Northwest companies.

Accomplishments of the Electric Transportation Association

Efforts which have been put forth by the Electric Transportation Association, San Francisco, in the development of electric transportation during the year just expired and the actual accomplishments along this line are contained in a report to the members by the retiring president, E. Kower of the Electric Storage Battery Company.

The association was largely instrumental in arranging for an electric truck school in San Francisco just prior to the N.E.L.A. convention in June. An electric truck luncheon was held at the San Francisco Electrical Development League on the opening day of the school. Immediately following this meeting a street parade of some eighty electric trucks passed the hotel in which the luncheon was held. An invitational luncheon for central station executives also was held during the N.E.L.A. convention.

The association conducted a co-operative advertising campaign during the year, in having an advertisement each month in three publications.

Legislative Work

Through the activities of the association a reduction in the state license

fees on electric trucks has been obtained as follows:

$\frac{1}{2}$ and $\frac{3}{4}$ -ton trucks.....	65 @ \$20 each	\$1,300
1-ton trucks.....	248 @ \$15 each	3,720
2-ton trucks.....	134 @ \$20 each	2,680
$3\frac{1}{2}$ -ton trucks.....	23 @ \$10 each	230
5-ton trucks.....	9 @ \$10 each	90

Approximate annual saving to owners of 479 trucks, \$8,020. The above tabulation excludes all electric trucks owned by public utilities which do not, under the California law, pay any license fees.

The association also has carried on a fight in the courts for declaring taxes previously levied against electric trucks as unconstitutional, and the organization has been advised by its attorneys that in all probability the decision of the appellate court will be in favor of the operators of electric trucks. If this decision is favorable it will mean a refund of licenses previously collected from owners of electric trucks aggregating in excess of \$65,000.

Number of Trucks Sold

During the year the following electric trucks have been sold in the territory adjacent to the San Francisco Bay region:

	No. of Trucks	Average Monthly Rev. per Truck	Revenue to Power Cos.	
			Monthly	Annually
Street trucks.....	35	\$15.00	\$525	\$6,300
Industrial trucks and tractors.....	20	12.50	250	3,000
Total	55		\$775	\$9,300

Puget Sound Company Properties Near Portland Are Sold

In a three-cornered deal involving approximately \$1,700,000, the two utility companies of Portland each acquire new properties located near Portland formerly operated by the Puget Sound Power & Light Company, Seattle. The unit centering around Hillsboro, Ore., including tied-in distribution systems serving also Beaverton, Orenco, Cornelius, Dilley and Gaston, Ore., falls to the Portland Electric Power Company, which for some time has supplied power wholesale for serving this unit. The ownership of the water systems at Hillsboro and at Vancouver, Wash., also passes to this company. The Inland Power & Light Company, owning certain properties operated by the Pacific Power & Light Company and Northwestern Electric Company, acquire the unit serving Woodland and Kalama, Wash., and Rainier, Ore. This unit is to be operated by the Northwestern Electric Company, which now is serving territory adjacent to it in Clark County, Wash.

The units of the Puget Sound company thus disposed of comprise all the properties south of Kelso, Wash., formerly attached to the southern district of the company. It is understood that the headquarters of this district will be moved from Portland to Chehalis, Wash., where it will be more nearly in the center of the remaining properties operated from it. E. T. Steel, formerly manager of the southern district, has been transferred to Bremerton, Wash., to manage the new western district of the company. (Journal of Electricity, Jan. 1, p. 27.)

Jacobs Bill Passes Washington House Despite Protests

The Jacobs Power Bill, permitting cities to sell power outside their limits at a tax of 5 per cent, recently slipped through the House of the Washington Legislature now in session at Olympia, on a vote of 50 to 42, despite the opposition of the anti-municipal power group, led by Elmer E. Shields of Seattle. B. F. Jacobs of Puyallup, framer of the bill, opened the fight for the measure, explaining its provisions, and declaring that it contained the good features of both the Reed and Bone bills defeated at the last election.

The passage of the bill was one of the big surprises of the session, inasmuch as it seemed doomed for defeat from the time of its introduction. The bill struck a snag at the start in the committee on public utilities. Nine of the eleven members recommended that it be postponed indefinitely.

The city council of Seattle went on record against the bill, and in resolutions sent to each of the King County members opposed it because of the taxing feature. Nine of the seventeen King County representatives disregarded the Seattle council plea and voted for the bill.

The bill permits the sale of surplus electric energy by cities generating their own power, within fifty miles of the limits of such cities. A tax of 5 per cent on the gross sales of power sold outside the city limits must be paid to the state. (Journal of Electricity, Nov. 1, 1925, p. 346.)

Jacobs claimed that the bill does not permit cities to go into the general power business but that it brings in more

taxes by providing for a 5 per cent tax on power sold outside. At the present time, he claims, the city of Tacoma is selling power to industries on its tide flats and to other places in close proximity, the sales amounting in 1924 to \$111,999.25, and that if the bill had been in effect, it is pointed out, more than \$5,000 in taxes would have been paid into the state treasury.

Telephone Company Places Order for Electric Trucks

The Southern California Telephone Company, Los Angeles, has placed an order for four 1-ton Walker electric trucks equipped with Exide Ironclad batteries. The telephone company also has been using a $3\frac{1}{2}$ -ton Auto-car electric truck equipped with an electric winch for cable-pulling and general heavy-duty city line work. The results of this test work have been highly satisfactory. It is believed this is the first company affiliated with the American Telephone & Telegraph Company to purchase electric trucks.

The American Railway Express Company, Oakland, Calif., has added three more 2-ton CT electric trucks to its Oakland fleet, which now contains eighteen units. The last holiday season was the heaviest one ever experienced in the East Bay territory, and the electric trucks have met every requirement of this exacting service.

Further Funds for the Minidoka Project Considered

A supplemental estimate for \$1,385,000 to be used during the next fiscal year for the completion of the American Falls reservoir on the Minidoka reclamation project in Idaho is being considered by the appropriation committee of the House of Representatives. The contract provides for a dam with a reservoir capacity of 1,040,000 acre-ft., with alternate provision for the construction of a dam for a reservoir of 1,700,000-acre-ft. capacity. The construction of the reservoir is being financed on a co-operative basis with various canal companies and irrigation districts in the Snake River Valley in Idaho.

The storage water now contracted for and the amount required by the United States for the development of the Minidoka north side extension exceed 1,040,000 acre-ft. and, since the demands for water are increasing, the most economical construction to meet these demands is considered to be a reservoir with a capacity of 1,700,000 acre-ft. The increasing demands for additional water insure the return to the United States within a year or two of the moneys advanced for this construction.

Federal Power Commission Grants Permit for Elwha River Project.—A preliminary permit for a power project in the Elwha River, Clallam County, Wash., has been granted by the Federal Power Commission to the Northwestern Power & Manufacturing Company, Port Angeles, for a period of two years. It is proposed to impound 15,000 acre-ft. of water, and construct a plant with capacity of 7,900 hp. The company proposed to build a concrete dam and adjacent power house developing a 160-ft. head in Glines Canyon.

News Briefs

New President to Head Electric Transportation Association.—E. C. Wood of the Pacific Gas and Electric Company, San Francisco, was elected president of the Electric Transportation Association at its regular December meeting, following the resignation of H. A. Fore, Philadelphia Storage Battery Company, due to his inability to attend regularly the meetings of the organization. At this meeting William Penfield, automotive engineer of the Associated Oil Company, gave a short talk on the subject of fleet operation. Mr. Wood followed this with a discussion on the work of the local chapter of the Society of Automotive Engineers.

Lift Water for Power Storage Reservoir in Japan.—A novel project, by which water is to be pumped from the Tadami-gawa River to a lake a considerable height above the river bed, whence during winter drought periods it may be dropped back to the river bed through a power plant, is to be constructed by the Tokyo Electric Light Company, according to "Denkinotomo." The plant is designed to develop 8,000 kw.

New Light and Power Company Organized.—The Farmers Mutual Light & Power Company, Bellingham, Wash., has been organized for the purpose of supplying Birch Bay, a popular summer resort, with electric light and power service. James H. Milholin, Bellingham, heads the company.

To Increase Little Spokane River Plant.—Sale of bonds amounting to \$60,000 has been announced by the Mt. Spokane Power Company, Deer Park, Wash., to secure funds for increasing its power plant on the Little Spokane River from 500 to 1,000 hp. and to extend service lines within its territory north of Spokane. About 1,000 customers were added in the past thirty months, about doubling the number of consumers of the company. The bonds sold represent a portion of the \$100,000 in bonds authorized in 1922.

B. C. Electric Railway Company Builds New Substation.—Owing to the large amount of travel to the new buildings of the University of British Columbia at Point Grey, the British Columbia Electric Railway Company is building a new substation, at a cost of \$87,000, at Dunbar Street and Twelfth Avenue, Vancouver. The substation, which it is expected will be put into operation by Christmas, will have three heavy feeders, joining the Fourth Avenue, Broadway, and West Point Grey lines. It will be automatic, practically noiseless, and the building will have the appearance of stucco residence.

Small Power Project Proposed for Crooked River, Ore.—Harry V. Gates, of Hillsboro, Ore., has applied for a license covering a project on Crooked River in Jefferson County, Ore. He proposes to construct a rock fill diversion dam 10 ft. high and 175 ft. long and 3,000 ft. of conduits to a power house where water will be pumped for irrigation purposes.

Street-Lighting Contracts Let in Pasadena.—Contract for the installation of an ornamental street-lighting system on East Colorado Street between Allen and Virginia Avenues, has been awarded to The Underground Construction Company, whose bid was \$40,934. A similar contract covering installation of lights on North Fair Oaks Avenue between Chestnut and Washington Streets was awarded to the firm of Ducey & Breitenstein at a price of \$44,000.

Another Montana Property Is Acquired by Tacoma Company.—The power and light property at Libby, Mont., consisting of steam and hydroelectric generating stations of about 400-kw. capacity and distribution lines serving Libby, has been acquired by H. M. Byllesby & Company. It probably will be operated by the organization of the Mountain States Power Company, Tacoma, a Byllesby company, according to C. M. Brewer, vice-president and general manager.

Utility Gets Option.—An option on the Craig (Colo.) Light & Power Company has been given by the Hendrie & Bolthoff Manufacturing & Supply Company of Denver to the General Light & Power Company of Chicago.

Washington Utility Plans New Building at Bellingham.—The Puget Sound Power & Light Company's branch at Bellingham, Wash., plans the construction of a fireproof storage and service building to house Skagit County offices and material for light and power department. H. B. Sewall is manager at Bellingham.

P.C.E.A. News

Secretary Requests Prompt Payment of Dués

Lack of promptness in the matter of dues payment for 1926 is causing embarrassment to the association, according to the statements of the secretary. Notwithstanding the fact that memberships date from Jan. 1 and the fact that bills covering dues have been sent to all members, Samuel H. Taylor, secretary of the association, states that remittances are not coming into his office in satisfactory quantities. Immediate attention to the matter is requested urgently by the secretary.

Lighting Committee Talk Given to Several Lunch Clubs

Carrying through its program of educational talks before the luncheon and commercial clubs of the state, the lighting committee of the Commercial Section, P.C.E.A., reported the special demonstration and talk recently launched before Electric Clubs (see Journal of Electricity, Jan. 1, 1926, p. 35), either given or scheduled to be given before a number of clubs.

D. C. Pence, Illinois Electric Company, assisted by T. L. Nudd, Allied Architects Association, both of Los Angeles, gave the talk to the Glendale Rotary Club, Dec. 17. G. H. P. Dellman, San Diego Consolidated Gas & Electric Company, gave the talk before the San

Diego Rotary Club Jan. 7. W. L. Chawnor, The Southern Sierras Power Company, assisted by T. L. Nudd, gave the talk to the El Centro Rotary Club on Jan. 14. The Los Angeles Ad Club is scheduled to hear the talk early in March.

The San Francisco Electrical Development League heard the talk presented by Louis Leury, consulting engineer of San Francisco, on Jan. 4.

Detroit Meetings of Hydraulic Committee Reviewed

By Walter Dreyer, Chairman Hydraulic Power Committee, P.C.E.A.

The following outline covers the main points discussed by the national hydraulic power committee at the Detroit meetings early in October. As is known, last year's national committee was organized with standing subcommittees to treat with principal subjects, each to continue in existence until a final report may be issued covering the subject under study by the subcommittee.

The national committee agreed to publish in its annual report the entire work of the Pacific Coast committee. This makes it necessary to speed up the following subjects in the local program in order that they may be completed at the Technical Section conclave in San Francisco in January.

(a) Effect of speed regulation and water hammer on the design of relief valves, surge chambers and penstocks.

(b) Obstruction to flow due to vegetative growth in conduits.

(c) Evaporation losses in storage reservoirs.

Remaining subjects dealing with penstocks may be carried over to the March meeting as they will be included in the serial report on penstocks that is to be published later.

Reports covering the work of the sixteen subcommittees of last year are in various stages of completion. Some are ready for publication at the present time and the others are to follow. Hydroelectric Plant Layout, Fish Ladders, and Vibration of Water Wheels, were the subjects under study by Pacific Coast committees. Of these reports the first has been completed, the second is awaiting results of tests being made in the Northwest, and tests made to date in the field of the third subject are to be covered in time for publication in the annual report of the national committee.

A.I.E.E. News

Spokane Section will be addressed at its next meeting, Jan. 22, by J. L. Stannard, chief engineer of the Cushman power project of the city of Tacoma. Mr. Stannard is to give an illustrated talk on the Cushman project.

Cummings C. Chesney, manager and chief engineer, General Electric Company, Pittsfield, Mass., has received official nomination for the office of president of the Institute for the year 1926-27, according to announcement from Institute headquarters.



News of the Electragists



Southern Division California Electragists to Meet at Catalina, January 22-23

The California Electragists, Southern Division, will hold its quarterly meeting at the Hotel St. Catherine, Catalina Island, Calif., on Friday and Saturday, Jan. 22-23. The convention party will leave Los Angeles via the Pacific Electric Railway at 9 a.m. Friday, Jan. 22, and will arrive at Catalina Island at 12:15 p.m. in time for luncheon.

The merchandising section will meet in the afternoon. Five ten-minute speakers will talk on the following subjects: advertising, display of merchandise, purchase of merchandise, salesmanship, and one other subject which has not been announced. A major portion of the merchandising program will be devoted to the subject of refrigeration and some speaker of note will present the talk on this subject. The report of the merchandising committee will include the results of its activities in conjunction with the Edison company with regard to range sales, monthly sales of some special piece of merchandise, and flat installation charges for ranges, water heaters, and air heaters.

Immediately following the merchandising meeting a members' meeting will be held at which time the report of the executive committee will be presented. The meeting will be open to questions and discussion from the floor.

The banquet will be held in the main dining room of the Hotel St. Catherine Friday evening at 6:30, followed by dancing at the Casino.

The general open meeting will be held Saturday morning, when speakers will be heard on the industrial lighting campaign and the Red Seal plan. Two more speakers probably will appear on the program, one of whom will present the California jobbers' impression of the Milwaukee plan, and the other a subject to be chosen by the executive committee. Another members' meeting will be held following the general meeting if it is deemed advisable by the officers.

All during the convention unique entertainment will be provided for the ladies, including trips over the sky-line drive, in the glass bottom boat and to other points of interest. Arrangements

have been made with the hotel for golf privileges for anyone desiring them.

The boat will return to Los Angeles at 3:30 p.m. Saturday afternoon, arriving at the Pacific Electric depot at 6:30 p.m. The cost of the convention, including transportation from Los Angeles to Catalina, hotel and four meals, and entertainment, will be \$13.50 per person, special rates being made for children. Arrangements have been made with the hotel so that members of the party may remain until Sunday afternoon if they wish. The charge for this additional period will be \$6 per person. Persons desiring reservations should communicate at once with California Electragists, Southern Division, 610 Cotton Exchange Building, Los Angeles.

San Francisco Association Elects Officers for 1926.—The Electrical Contractors and Dealers' Association of San Francisco has elected the following officers to serve during the year 1926: president—Charles Shipman, Atlas Electric Company; vice-president—Sam Radelfinger, Radelfinger Brothers; executive committee members: Victor Lemoge and Edward Martin, Sterling Electrical Company.

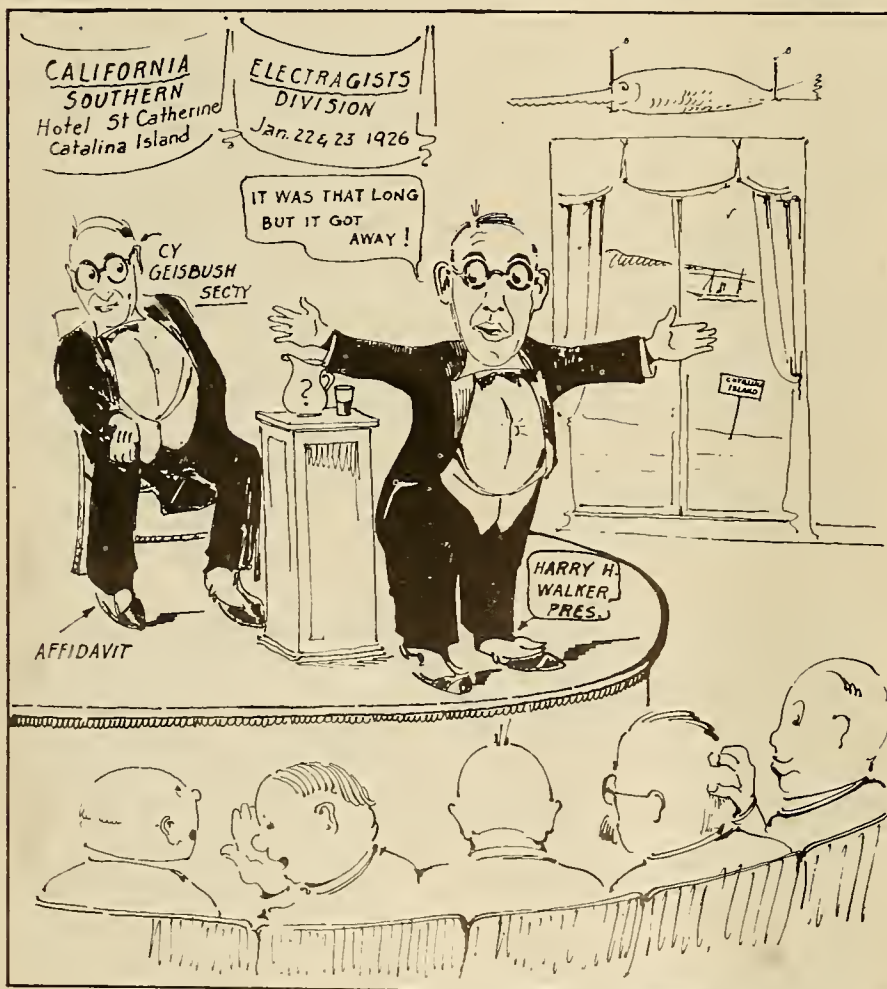


Charles Shipman, who has been elected president of the San Francisco Association of Electrical Contractors and Dealers. Mr. Shipman has been connected with the electrical industry in San Francisco for nearly thirty years, beginning with his employment by the National Electric Company. In January, 1920, he became a partner in the Stimmel Electric Company, which later became Shipman-Lauer. In September, 1924, that concern purchased the Atlas Electric Company and has operated under that name since that time.

Branch of California Electragists, Southern Division, Formed at Long Beach.—At a recent meeting of electragists in Long Beach, a local branch of the California Electragists, Southern Division, was organized. The six charter members who attended this meeting were: Acme Electric Company, Baty Electric Company, Kuster-Wetzel Electric Company, Lane Electric Company, Mott Electric Company, and Newcomb Electric Company.

The Stewart Electric Company, Seattle, has purchased property at First Avenue South and Stacy Street to which the company will move as soon as certain alterations are completed. The firm now is located at 206 First Avenue South.

Two electrical contractor-dealer firms of Fort Collins, Colo., have been reorganized and combined under the name of Stallings & Polley, Inc. The incorporators are C. A. Polley, E. E. Polley and William E. Stallings.



The atmosphere may prompt the president to indulge in piscatorial reminiscences.

Meetings

Fitting Observation of Yuletide by Seattle Electric Club

The Electric Club of Seattle on Dec. 21 in the club's Chamber of Commerce quarters entertained its membership with a Christmas tree and turkey drawing. Presents were distributed to each member by Tom Wood, vice-president of the club. The prize drawing for turkeys and boxes of oranges resulted in Tom Wood and George W. Cooley, of the George W. Cooley Electric Company, winning the national birds, and Charley Callahan of the A. G. Manufacturing Company, and George T. Thirsk, electrical engineer, the oranges.

A program of Christmas carols and a banquet preceded the prize drawing.

The club furnished the Christmas tree decorations for three trees donated by the Mountaineers Club to the Seattle Orthopedic Hospital. The lighting outfits, bought with Electric Club funds, were made up by the following club members: Jack Way, Tom Wood, D. U. Chamberlain, George T. Thirsk, Charley Campbell, George Campbell, Leonard Johnson, Harry J. Martin, Fred Block and Jim Stuart. Fifteen strings with an average of 16 lamps were made up.

Annual Christmas Party Held for Employees' Children

The annual Christmas party for children of employees of the Tacoma Railway & Power Company, was held Dec. 19. More than 1,000 were in attendance, of whom 600 were children. This year's party was devoted particularly to the children, each child receiving a present and a box of candy from Santa Claus. Those in charge were C. S. Reynolds, R. C. Saunders, George Levenhagen, W. M. Ringrose, L. L. Lamb and T. F. Marsh. Talks were made by R. T. Sullivan, manager, and G. W. Rounds, assistant manager.

Annual Stag Frolic of Salt Lake Electrical Men.—The male members of the electrical fraternity, and their friends, of Salt Lake City and adjacent territory, gathered at the Elks Club in Salt Lake City on the evening of Dec. 5 for their annual "Elektrik-Nite" frolic, sponsored by the Rocky Mountain Electrical Co-operative League. The affair was in the nature of a stag party, and was attended by more than 600 men of the industry. A program, consisting largely of athletic events, which included boxing and wrestling and musical numbers, was enjoyed thoroughly. Later refreshments were served.

Electrical Wholesalers Hold Open Meeting.—The annual meeting of the Electrical Wholesalers' Association was open to other members of the industry, and was held in the Italian room at the Whitcomb Hotel, San Francisco. Kenneth A. Millican, of the Pacific National Bank, was the speaker of the evening. His subject was "Three Points of Contact," and his address mentioned sales methods which might well be applied to the electrical industry.

Puget Sound Employees Have Big Christmas Celebration

On Tuesday evening, Dec. 22, the Puget Sound Power & Light Company, Seattle division, entertained 2,000 members of the Seattle organization, including wives and families, at a Christmas tree and carnival. The celebration, held at the Masonic Temple, is an annual affair. Cartloads of candy and all sorts of gifts were distributed by A. W. Leonard, president of the company, in the role of Santa Claus, assisted by Mrs. W. B. Donaldson, as Mrs. Santa Claus.

In Bellingham, headquarters of the northern division of the company, at Liberty Hall, James J. Ferrari acted as Santa Claus for the Bellingham employees and their families.

A Christmas tree and celebration similar to those held in Seattle and Bellingham also was held for Tacoma employees, wives and families.

COMING EVENTS

California Electragists, Southern Division—

Quarterly Meeting at Catalina, Calif.
Hotel St. Catherine, Jan. 22-23, 1926

Rocky Mountain Division, N.E.L.A.—

Section and Committee Conference
Idaho Springs, Colo.
Jan. 26-26, 1926

Western Association of Electrical Inspectors—

Chicago, Jan. 26-28, 1926

National Association of Railroad and Utilities Commissioners—

Kansas City, Baltimore Hotel
Feb. 9-12, 1926

Accounting Section, Northwest Electric Light and Power Association—

General Group Meeting, Portland, Ore.,
Feb. 1, 1926

American Institute of Electrical Engineers—

Midwinter Convention in New York
Feb. 8-12, 1926

Electrical Men of Colorado—

State-wide meeting under sponsorship of
Electrical League of Colorado
Denver, March 26, 1926

Pacific Coast Electrical Association—

Annual Convention—Biltmore Hotel, Los Angeles
June 8-11, 1926

Women's Committee Stages Minstrel Show.—The Women's Committee of the electrical industry in Spokane staged a Women's Minstrel Show at the third annual Electric Ball given on Nov. 20 for employees of The Washington Water Power Company, the Spokane Central Heating Company and the Spokane United Railways. Maude McDonald, of the commercial department, The Washington Water Power Company, acted as interlocutor. About 600 attended the dance. The Women's Committee, acting as a local chapter of that committee of the Northwestern Electric Light and Power Association, has had an active program since its organization early in this fall. Mary K. Walsh of the department of public relations, The Washington Water Power Company, is chairman of the Spokane committee.

Colorado Electrical Men to Hold State-Wide Meeting.—A state-wide meeting of electrical men under the sponsorship of the Electrical League of Colorado is scheduled to be held in Denver March 26. After considering the matter at a number of sessions the advisory board adopted the recommendation of the special committee headed by L. M. Cargo.

Book Reviews

GUIDING PRINCIPLES OF PUBLIC SERVICE REGULATION

By HENRY C. SPURR, Editor of Public Utilities Reports, Vol. I, Rochester, N. Y., and Washington, D. C.: Public Utilities Reports Inc. Cloth; 6 x 9 in.; 752 pages; full index. \$7.50.

Those who wish a digest of both commission and court rulings on the regulation of public utilities will find this a useful volume. After a brief review of the origin and growth of commissions and their powers, the author deals with the control of utilities in general, security issues, accounting, rates and various services. Limitations of commission regulation and distinctions between the powers of commissions and courts next are considered. There follow discussions of the various elements of rate-making and valuations for rate control. Compared with most of the books on utility regulation this one gives unusual attention to the rulings of the commissions, bearing in mind that many of these govern details of service which never or rarely come before the courts and for which, therefore, no precedent exists. A 50-page index and a table of cases also filling 50 pages provide easy reference to the mass of detail which the volume contains. For the benefit of those who have no time to go through the detailed reviews, most of the chapters conclude with a brief summary.

"Western States Gas & Electric Company," a booklet of ten pages, has been published by the Byllesby Engineering & Management Corporation. After stating that the Western States company serves 50,000 customers in 38 communities in eight counties of central and northern California, the book goes on to discuss its electric and gas plants, with particular attention to the El Dorado hydroelectric plant on the South Fork of the American River. Two pages are devoted to the diversified demands for service made upon the company, and the benefits of group operation are pointed out, the Western States company being operated under the direct supervision of the Byllesby Engineering & Management Corporation. The company, which has adopted the policy of customer-ownership, extends an invitation to the users of its service and other residents of the territories served to invest in its 7 per cent cumulative preferred stock. The booklet is illustrated with some very attractive photographs.

Purdue University Issues Bulletin on Watthour Meter Accuracy.—"Watthour Meter Accuracy as Affected by the Temperature Changes" is the subject of Bulletin No. 22 of the Engineering Experiment Station of Purdue University. Suitable text and 14 curves give some interesting information.

Personals

E. R. Northmore, superintendent electric distribution, Los Angeles Gas and Electric Corporation, Los Angeles, has been named general convention chairman for the 1926 convention of the



E. R. NORTHMORE

Pacific Coast Electrical Association. He has a long record for service in the electrical industry, for thirty-three years ago he entered the employ of the Los Angeles company as a lamp trimmer and consequently is an excellent object lesson in the art of "working up from the bottom." Since 1914 Mr. Northmore has been president of the Joint Pole Committee; a co-operative organization of twenty-one public utility systems which has saved to the consumers of southern California the cost of two hundred thousand poles. He has taken an active interest in the affairs of the electrical industry and is well known among its members, particularly in the West. Mr. Northmore is a member of the American Institute of Electrical Engineers and has served as chairman of the Los Angeles Section. He is also a member of the National Electric Light Association, in which he has served as chairman of the underground systems committee and in various other capacities.

J. L. Stannard, chief engineer of the Cushman power project of the city of Tacoma, recently was presented with a gold watch and chain by fellow employees as a token of appreciation for his services. B. E. Torpen, construction superintendent, made the presentation in the presence of the staff.

Harry A. Mulvaney, formerly with the Electric Sales Service Company, Berkeley, Calif., has accepted a position with the Majestic Electric Appliance Company, San Francisco, as designing engineer.

H. R. Austin, after twenty-five years of continuous service with the Los Angeles Gas and Electric Corporation, has resigned his position as assistant to the president, and retired to private life to take care of personal interests. On behalf of the corporation, A. B. Day, vice-president and general manager, presented Mr. Austin with a fine gold wrist watch.

Harry J. Martin, Seattle representative of the National Carbon Company, former president of the Electric Club of Seattle, recently spent some time in San Francisco.

Harry P. Cramer, assistant to superintendent, Portland Electric Power Company, Portland, attended a meeting of the National Nominating Committee, A.I.E.E., in New York, in December.

H. H. Schoolfield, chief engineer, Pacific Power & Light Company, Portland, was nominated for vice-president, Northwest district, A.I.E.E., at a meeting of the National Nominating Committee in New York in December.

E. O. Howard, president of Walker Brothers, bankers, of Salt Lake City, was re-elected president of the Utah Light & Traction Company, and chairman of the board of directors, at a special meeting of the board Dec. 15. D. C. Green and O. J. Salisbury were re-elected vice-president, George B. Thomas, secretary-treasurer, and John F. Scheib, assistant secretary-treasurer. The executive committee was re-elected as follows: D. C. Green, chairman; E. O. Howard, David A. Smith, F. C. Schramm, J. M. Bidwell.

Heckert L. Parker, formerly manager of the Pacific Radio Trade Association and more recently connected with the sales department of the Magnavox Company, has been appointed factory manager for the latter company with headquarters at Oakland, Calif.

W. W. Briggs, manager of the Grays Harbor Railway & Light Company of Aberdeen, has been appointed general chairman of the Grays Harbor county committee which is now delving into the financial phases of the proposed Olympic peninsula railway.

C. A. Harmony, district manager at Enumclaw, Wash., for the Puget Sound Power & Light Company for the last eight years, has been transferred to the Waterside division of that company as division superintendent. The Waterside division includes all of the district from the north city limits of Seattle to Everett. E. A. Wills, at present manager of the Kent, Wash., office, will be transferred to the Enumclaw district to succeed Mr. Harmony.

Arthur E. Rowe, of Garnett Young & Company, San Francisco, has been elected a director of the United Bank and Trust Company of California.

C. H. Knowles, an electrical engineer associated with John Graham, Seattle architect, is a new member of the Electric Club of Seattle.

Lorne A. Campbell, vice-president and managing director of the West Kootenay Power & Light Company, Rossland, B.C., has left for Australia. He will be away for several months.

J. C. Clark, until recently associated with the Pacific Electric Manufacturing Company, San Francisco, has joined the experimental staff of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, in the materials and process engineering department.

Arnold Pfau, Jr., formerly sales engineer of the American Resistor Corporation, manufacturers of Globar, has been appointed San Francisco representative of that company with headquarters in the Sharon Building. He is the son of Arnold Pfau, president of the American Resistor Corporation and consulting engineer in the hydraulic department of the Allis-Chalmers Company.

Clifford Cowling, for the past five years with the Northwestern Power & Manufacturing Company, Port Angeles, Wash., has been placed in charge of the Puget Sound Power & Light Company's transmission line maintenance between the north side of Hood's Canal and Port Angeles.

Arthur S. Dempsie, since 1919 with the Pacific Power & Light Company, Portland, first in the railway department at Astoria, Ore., and later in the investment department, has been appointed district manager at Seaside, Ore., taking the place of E. W. Rouleau, resigned.

E. D. Searing, advisory engineer, Portland Electric Power Company, Portland, has been appointed to the Oregon Technical Council as the representative of the A.I.E.E.

F. W. Davies, formerly with the Great Western Power Company, Sacramento, Calif., has been transferred to the San Francisco division of the company.

Leonard Clarke, Vancouver, Wash., manager for the Portland Electric Power Company, has been elected vice-president of the Vancouver Kiwanis Club.

Ray W. Turnbull, for the past eighteen months assistant Pacific Coast sales manager, Edison Electric Appliance Company, Inc., has been made Pacific Coast district manager, effective Jan. 1. P. H. Booth, who has been appointed a vice-president of the company, will maintain his headquarters in Los Angeles. Mr. Turnbull has been a member of the electrical fraternity for a number of years, having been initiated by the Southern California Edison Company in Pasadena, Calif. He left that organization to join the Pacific Electric Heating Company, Ontario, predecessor of the Edison Electric Appliance Company. As electric heating specialist, he became associated with the General Electric Company, San Francisco, in 1911, being transferred shortly thereafter to Portland, Ore., in the same capacity. After the war, in which he earned a commission in the aviation



RAY W. TURNBULL

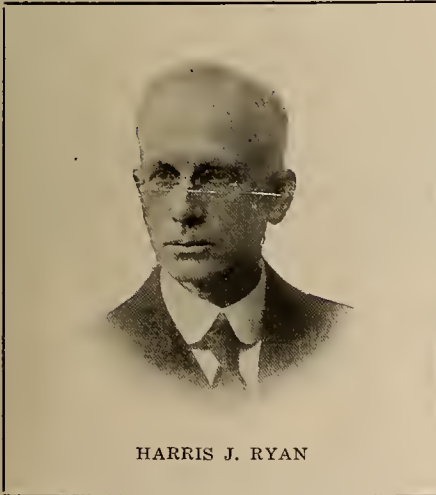
corps, Mr. Turnbull entered the employ of the Edison Electric Appliance Company, with direct supervision over the Northwest territory. In 1924 he was appointed assistant Pacific Coast sales manager. As district manager, Mr. Turnbull's office will be in San Francisco, which will be Pacific Coast headquarters.

E. G. Frosty, formerly with the California Wholesale Electric Company, 413 East 11th Street, Los Angeles, has severed his connections with that firm.

A. C. McMicken, sales manager, Portland Electric Power Company, Portland, Ore., recently visited Salt Lake City.

George T. Thirsk, electrical engineer Seattle, was the official Santa Claus of the Electric Club of Seattle at a Christmas tree celebration and party sponsored by the club at the Orthopedic Hospital on Christmas morning.

Harris J. Ryan, professor of electrical engineering at Stanford University, Palo Alto, Calif., has been awarded the Edison Medal for the year 1925 "for his contributions to the science and the art of high-tension transmission of power." The greatest part of Professor Ryan's time at Stanford University has been devoted to research work in connection with high-voltage transmission. He is considered one of the foremost authorities on the subject of corona and has developed a high-voltage wattmeter for measuring corona and other power losses on high-voltage circuits. All experimental work to be carried on in the new 2,000,000-volt laboratory at the university will be in Professor Ryan's charge, and upon its completion his entire time will be devoted to research in connection with that equipment. Professor Ryan received the degree of M.E. in electrical engineering from Cornell University in 1887, and in 1888 entered the employ of the Western Engineering Company at Lincoln, Neb. A year later he was made instructor in charge of the electrical machinery laboratory at Cornell; from 1890 to 1895 he served as assistant professor of electrical engineering in provisional charge of the department. Then he became professor in charge of the department of electrical engineering, leaving there in 1905 to accept the position at Stanford University that he still holds. Professor Ryan has served as director, vice-president and president of the A.I.E.E., and is a member of a number of other engineering and scientific societies. He also has been active in an advisory and



HARRIS J. RYAN

consulting capacity, having acted as consulting engineer for the Los Angeles aqueduct, as a member of the Pacific Coast section of the Submarine Group, National Research Council, during the war, and having been in charge for the Research Council of the Supersonics Laboratory at Pasadena in 1918 and 1919.

Fred W. Carlson, Seattle representative of the Crouse-Hinds Company, recently returned to Seattle following a several weeks' business trip through Eastern centers. While away he attended the meeting of the American Electric Railway Association at Chicago and also spent some time in Syracuse going over some new engineering development. He returned via San Francisco.

E. N. Brown, president and general manager, Majestic Electric Appliance Company, San Francisco, is in the East on an extended business trip, visiting Philadelphia, New York and other points.

H. W. Bertholas, formerly foreman of the Pacific Gas and Electric Company's Pit No. 3 plant, has been made superintendent of Pit No. 1, Pit No. 3, Hat Creek No. 1 and Hat Creek No. 2 power houses, following the resignation of M. P. Werry. Mr. Bertholas' headquarters will be at Fall River Mills, Calif. **W. E. Dunwoody** succeeds as foreman at Pit No. 3. **Charles E. Smith** is foreman at Pit No. 1, and **Ed Stone** is foreman at the two Hat Creek power houses.

Leonard A. Hobbs, Pacific Coast district manager for The Edwin F. Guth Company, St. Louis, has announced that, effective Dec. 15, Oregon, Washington and British Columbia have been added to the territory under his jurisdiction. Mr. Hobbs will make his headquarters in San Francisco.

B. M. Atkins, manager of the Kelso-Longview, Wash., division of the Puget Sound Power & Light Company, was a recent speaker at a luncheon meeting of the Kelso Merchants Association. He told of the growth and development of the Puget Sound Power & Light Company in Kelso and nearby cities.

C. A. Lund of the city light department, Tacoma, Wash., a past president of the American Institute of Electrical Engineers, has been elected president of the Tacoma Engineers' Club for 1926. **E. E. Foote** of the Consumers' Central Heating Company and **C. A. Miller** of the Puget Sound Power & Light Company, were chosen vice-presidents. **William J. Welsh**, of the Puget Sound Power & Light Company, has been named secretary. These officers, with **William Roberts**, consulting engineer; **Glen Parker**, U. S. Geological Survey, and **K. A. Kunig** of the city of Tacoma water department, constitute the board of directors.

H. L. Sampson, formerly substation engineer in the operating department of the Southern California Edison Company, Los Angeles, has been appointed superintendent of wholesale power for that company. In his new capacity he will retain a large percentage of his previous duties and in addition will assume responsibility for all arrangements in connection with service to the wholesale power consumers of the company.

E. T. Steel, formerly manager of the southern district, Puget Sound Power & Light Company, has been named manager of the newly formed western district with headquarters at Bremerton. **C. F. Kirchhaine** has been appointed acting assistant treasurer; **F. H. Kerr**, sales manager; **E. R. Night**, superintendent of light and power; **W. F. Sachtleben**, resident manager at Bremerton; **J. L. Keeler**, resident manager at Sequim; and **J. M. Kinkaid**, resident manager at Port Townsend.

Stanley V. Walton, who started his business career in the electrical industry, has returned to that field with his acceptance of the managership of the home department of the Oakland division of the Great Western Power Company of California. He succeeds **O. R. Doerr**, who has become manager of the heater division of the Magnavox Company, Oakland. After graduating from the University of California in 1904 with the degree of electrical engineer, Mr. Walton entered the employ



STANLEY V. WALTON

of the Pacific Gas and Electric Company in 1905. Three years later he was made manager of the commercial department, remaining in that position until Dec. 31, 1917, when he resigned to take up fruit ranching in Sutter County. After four years of life on the farm he returned to commercial life as sales manager for Bonestell & Company, San Francisco, leaving there in the latter part of 1924 to become associated with Blair & Company, with whom he has been connected for the past year. Members of the electrical fraternity will be glad to welcome Mr. Walton back to the fold.

Harry H. Daley, formerly with the Majestic Electric Development Company, and more recently with the Magnavox Company of Oakland, has accepted a position with the Majestic Electric Appliance Company, San Francisco, as sales manager.

Obituary

George Newman, president, Vallejo Electric Light & Power Company, Vallejo, Calif., died in San Francisco, Jan. 4, following an illness of five days.

Romulus Riggs Colgate, a pioneer in the development of electric power in California, died Jan. 6, in Sharon, Conn. He was instrumental in the consolidation of the Nevada Power Company and the Yuba Electric Company into the Bay County Power Company in 1892 and later in the establishment of the California Gas and Electric Company, the predecessor of the Pacific Gas and Electric Company. The latter company's Colgate power house was named in his honor.

TRADE NOTES

Automatic Electric Washer Company, Newton, Iowa, has completed a new model No. 76 copper tub electric washer with a number of improved features, among them being the new wringer; the Duco finished and electric spot-welded steel base; the hydro-disc washing principle that washes by water action and drives from the top and not through the tub bottom; the self-draining corrugated copper tub; the double aluminum top; the worm gear drive; the standard appliance plug on attachment cord, and many other advantageous features.

Malleable Iron Range Company, Beaver Dam, Wis., has appointed L. J. O'Brien, formerly with the Great Western Power Company of California, San Francisco, to handle the Monarch electric range, manufactured by the Malleable Iron Range Company. He will represent the company for this product in California, Nevada and western Arizona.

Allis-Chalmers Manufacturing Company, Milwaukee, has issued bulletin No. 2082, which is fully descriptive of its centrifugal boiler feed pumps. Bulletin No. 1823, issued recently, describes crushing rolls, from their mining machinery department, while Bulletin No. 1228 illustrates and describes the Allis texrope drive, manufactured in the transmission department.

The Ludlum Steel Company, Watervliet, N. Y., is making many additions to its plant. The capacity of the billet grinding department has been doubled, the new addition being completed and ready for occupancy early in January. The new department is equipped with a most modern exhaust system for the elimination of the dust incidental to all grinding operations.

Rome Wire Company, Rome, N. Y., is publishing a series of bulletins dealing individually with every type of wire. The first two cover magnet wire and super service cord. The third deals with bare wire and contains useful data and tables regarding construction, sizes, weights, current carrying capacities and other items.

The Allen-Bradley Company, Milwaukee, manufacturer of electrical controlling apparatus, has published recently a bulletin on its graphite disc rheostat for general industrial applications. Copies of the bulletin will be furnished to anyone interested in this product.

Simplex Wire & Cable Company, Boston, has opened a branch office in the Lew Building, St. Augustine, in order better to care for the steadily increasing volume of business in Florida. F. H. Pettie will be manager of the new office.

Chicago Fuse Manufacturing Company, Chicago, has appointed F. L. Williamson as eastern sales manager, with headquarters at 71 Murray Street, New York.

trode holders and other accessories.

Automatic & Electric Furnaces, Ltd., London, has issued an interesting catalog on the Wild-Barfield electro-magnetic furnace for the automatic hardening of steel.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, has placed on the market a new electric range known as the Senior Cabinet. One of the noteworthy features is an exceptionally large oven 18 in. high, 15 in. wide and 17½ in. deep with a lining of vitreous enamel. The range is furnished with Westinghouse automatic control for the oven operation and has reciprocating switches and a 1,000-watt appliance receptacle. It occupies a space 54 in. high, 24½ in. deep and 46¼ in. long. It is manufactured in either black japan or grey enamel finish.

Western Electric Company, New York City, has just issued its 1926 Fan Manual featuring its corps of "silent salesmen," namely, window displays, folders or envelope inserts, newspaper advertisements ready for dealer's name and address, cuts for dealers who may wish to write their own advertisements, and window posters. The booklet is compiled attractively, with actual copies of two of the folders, and artistic reproductions of the window displays, advertisements, cuts and posters.

Condit Electrical Manufacturing Company, South Boston, has issued catalog No. 1006-2, covering switchboards manufactured by the company. The pamphlet is illustrated with drawings and photographs and is fully descriptive of the various types of switchboards developed by the company.

The National Carbon Company, Seattle, has moved its offices from 1301 to 1501 L. C. Smith Building. Harry J. Martin is the district representative.

General Electric Company, Schenectady, has issued recently a 160-page catalog for 1925 and 1926 covering industrial control. The book contains much information, with a complete index of subjects covered. Price lists are given with ordering directions. Another interesting publication recently produced is bulletin No. GEA-123, covering automatic voltage regulators for alternating-current generators. An attractive 44-page booklet containing photographs and covering the electrification of the Chicago, Milwaukee & St. Paul Railway, is a recent publication also produced by the General Electric Company.

H. B. Sherman Manufacturing Company, Battle Creek, Mich., recently has made extensive expansions in its plant, including larger brass foundry and finishing shop where it is producing cast brass goods such as hose fittings, compression work and pipe fittings. Improvements also have been made in the stamping departments for the production of electrical lines and sheet brass hose fittings.

Ward Leonard Electric Company, Mt. Vernon, N. Y., has issued recently bulletin 69 on Vitrohm battery-charging equipment that contains a complete price list. Through a typographical error announcement of this bulletin appeared in the Dec. 15 issue under the name of Ward Electric Company.

Chicago Fuse Manufacturing Company, Chicago, has developed a new type of "Union" outlet box designed especially for use with armored cable in lath and plaster construction. It also is adapted for loom and is made in three styles.

The Magnavox Company, Oakland, Calif., has started an advertising campaign in the California newspapers featuring its new Magnaray electric heaters.



"Busy Buttons" as collectively portrayed by a group of Southern California Edison Company officials at the annual Christmas party held Dec. 18. It is apparent that they are all taking their new duties much to heart. Those in the group are: seated, left to right—F. B. Lewis, R. H. Ballard, B. F. Pearson, H. W. Dennis. Standing—Will Fisher, W. L. Frost, A. R. Kelley, D. M. Trott, R. E. Smith, S. C. Haver, Jr., C. P. Staal, F. L. Greenhouse and E. R. Davis. Miss Helen Hineman is in the center of the group.

Journal of Electricity

Devoted to the Economic Production and Commercial Application of Electricity
IN THE ELEVEN WESTERN STATES

AN IRRESISTABLE COMBINATION



WIRING SYSTEM
—for lifetime service—

During 1926—"Check" Seal Electrical Contractors and Retailers will receive the double-barrelled support of two well planned intensive advertising campaigns. Read further details on pages 4 and 5 of this issue.

PACIFIC STATES
ELECTRIC COMPANY

Merchandise Distributor
GENERAL ELECTRIC



Announcing the Wonderful New-Hotpoint Super-Iron

MARVELOUS NEW ELECTRIC IRON DEVELOPED

California Manufacturer Perfects An Electric Heating Element Cast In Solid Iron

For years the engineers of the Edison Electric Appliance Company have been endeavoring to perfect an electric heating element which would attain higher efficiency and be practically indestructible. The result is "Hotpoint Calrod" element.

For several years this new element has been subjected to the most strenuous service known and has demonstrated its durability; for instance in commercial laundry irons, where each year's use is equal to over 20 years in the average household.

Now Hotpoint Calrod heating element is being incorporated in the new Hotpoint Super-Iron. The Calrod element is cast in the solid iron heat reservoir at 2250° Fahrenheit (molten iron). The fact that Hotpoint Calrod element stands this terrific heat without damage is the best indication that it will not be harmed by the most extreme temperature condition arising in service. Moreover the element is forever sealed in and protected against damage.



Cut-away view showing Patented Hotpoint Calrod. Cast in solid iron heat reservoir of the Hotpoint Super-Iron.



This new box will look attractive on your shelves. Wonderfully improved, but no advance in Price.

Only \$6

Other Hotpoint Advantages

The Most Popular Iron made even Better

The New Hotpoint Super-Iron with the Patented Hotpoint Calrod Heating Unit provides the greatest talking point in the sale of electric irons made available for the dealer in 22 years.

Dealers carrying the New Hotpoint Super-Iron NOW will cash in on the eleven million messages to the public appearing in Hotpoint advertisements within a period of 35 days.

Back up this publicity with window displays and newspaper advertisements. The desire to own a Hotpoint Super-Iron will come to thousands in your community.

Stock up now with the New Hotpoint Super-Irons and get your share of the profits which can be obtained.

EDISON ELECTRIC APPLIANCE CO., Inc.
Pacific Coast Headquarters and Factory, Ontario, Calif.

LOS ANGELES • SAN FRANCISCO • PORTLAND • SEATTLE
SALT LAKE CITY • CHICAGO • BOSTON • NEW YORK
ATLANTA • CLEVELAND • ST. LOUIS

In Canada, Canadian General Electric Co., Ltd., Toronto
5620 West Taylor St., Chicago, Ill.

Hotpoint

SERVANTS

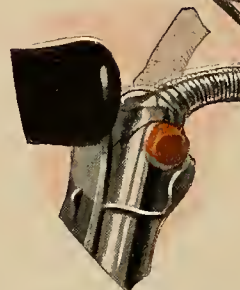
© 1926, E. E. A. Co.



Hotpoint's Patented Thumb Rest

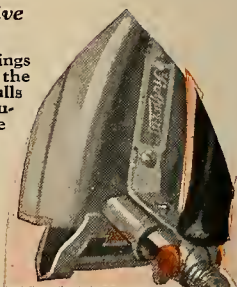
An exclusive Hotpoint feature. You can never know how much this rests your wrist, arm and shoulder until you use it. Go to your nearest dealer's and try it for yourself.

So great has been the demand for this comfort feature that it is now made even for left-handed women.



Hotpoint's Exclusive Hinged Plug

As you iron, the cord swings and tends to bend at the plug. Sometimes it pulls taut. In the Hotpoint Super-Iron plug the hinge bends instead and saves the cord. Inside the plug a special fitting prevents any pull or jerk from loosening the connections. Even the weight of the iron falling from the ironing board will not pull the wires loose from the connections in the plug.



Hotpoint's Heel Stand

Lifting an ordinary iron on and off its stand 150 times during an ironing is equivalent to lifting almost a ton. With the Hotpoint, you merely tilt it back on the heel stand anywhere on the board - then tilt it forward again and continue ironing.

ILLUSTRATED BELOW ARE SOME OF OUR PRODUCTS USING PATENTED HOTPOINT CALROD HEATING ELEMENTS



HOUSEHOLD RANGES • TABLE STOVES • PERCOLATORS • CURLING IRONS • WAFFLE IRONS • WATER HEATERS • HOUSEHOLD RANGES

Journal of Electricity

With which is consolidated the "Electrical Journal" and the "Journal of Electricity, Power & Gas."
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IN THE ELEVEN WESTERN STATES

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Radio Retailing

Power

Statistical Chart Reprints to Be Available

FEW issues of any technical publication contain so graphic a picture of the development of the electrical industry as is contained in the carefully and elaborately prepared statistical tables published in this issue. It goes without saying that these tables are of great value to those interested in electrical development, whether from an engineering or from a commercial standpoint.

To make these tables available to those who might prefer them in a concentrated leaflet, convenient to carry about or file, the Journal of Electricity is planning to make reprints of them, which may be obtained by writing to the offices of this publication.

Reprints of the tabular matter contained in this issue, dealing with the construction in hydroelectric and steam plants and transmission lines will be available as one group. These are the tables which appear on pages 80 and 81, showing the additions to the hydroelectric generating plants in the eleven Western states, 1925-1926; those containing the additions to the steam generating plants in the eleven Western states, 1925-1926, pages 82-83, as well as the table showing the additions to the transmission systems in the eleven Western states, 1925-1926, on pages 86 and 87.

The surveys of the industrial load, also in graphic tabular form, likewise will be available as reprints.

Those wishing copies of these reprints may address their requests to the Journal of Electricity, 883 Mission Street, San Francisco, where prices for the reprints and other details concerning them will be furnished gladly.

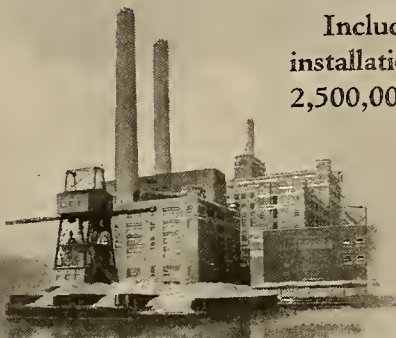
BURNING ALL KINDS OF FUEL

POWER stations making records for economy with all kinds of fuel are among recent Stone & Webster work. They include stations with stokers burning a wide range of coals, and stations burning pulverized fuel, oil, and natural gas. Some of the coal burning and some of the oil-burning stations are designed for changing at any time to pulverized fuel. Where gas is burned the stations permit changing to oil or pulverized fuel. This Stone & Webster experience covering conditions in all parts of the country and with all kinds of fuels is offered to those contemplating new plants or extensions.

Including the plants here shown, Stone & Webster installations for industry and the public utilities exceed 2,500,000 horse power.

RIVER-DREDGED. ANTHRACITE.

American Sugar Refining
Company, Baltimore, Md.



BITUMINOUS COAL

The Edison Electric Illuminating Co. of
Boston,—Edgar Station.



PULVERIZED FUEL

Ford Motor Company,
St. Paul, Minn.



OIL

(or Pulverized Fuel)

Montaup Electric Company,
Fall River, Mass.



NATURAL GAS (or Oil)

Southern California Edison Company,
Los Angeles, Cal.—Long Beach Station.



STONE & WEBSTER

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BOSTON, 147 MILK STREET

NEW YORK, 120 BROADWAY

CHICAGO, FIRST NATIONAL BANK BLDG.

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SAN FRANCISCO, HOLBROOK BLDG.

PITTSBURGH, UNION TRUST BLDG.

EDITORIAL

Progressing Toward the Goal

WERE Horace Greeley speaking of electrical development when he admonished the youth of the country to turn their steps westward he might well have said, "Look West," for in those states on the Pacific side of the Rockies electricity is king. With but eight per cent of the population, central stations of the eleven Western states today have 14.3 per cent of the total central-station consumers and 14 per cent of the wired homes of the country; they generate 19.5 per cent of the country's electric energy and 45 per cent of the total energy produced by hydro plants. Western industry is 65 per cent electrified, the highest proportion in the United States, and central stations supply approximately 80 per cent of the electric energy consumed in industrial plants in this section.

DESPITE such a record of accomplishment, there is no tendency on the part of the electric light and power industry of this section to allow its vision to become impaired or to rest on its oars. Rather its mind is intent on the bigness of its present job and the possibilities of the future. This is evidenced by the fact that during the year just closed the program of central station construction was the greatest in the history of the industry. Western central stations during 1925 added 401,125 kva. to the installed capacity of the generating plants and have mapped out a program of construction in keeping with the unprecedented growth of this territory.

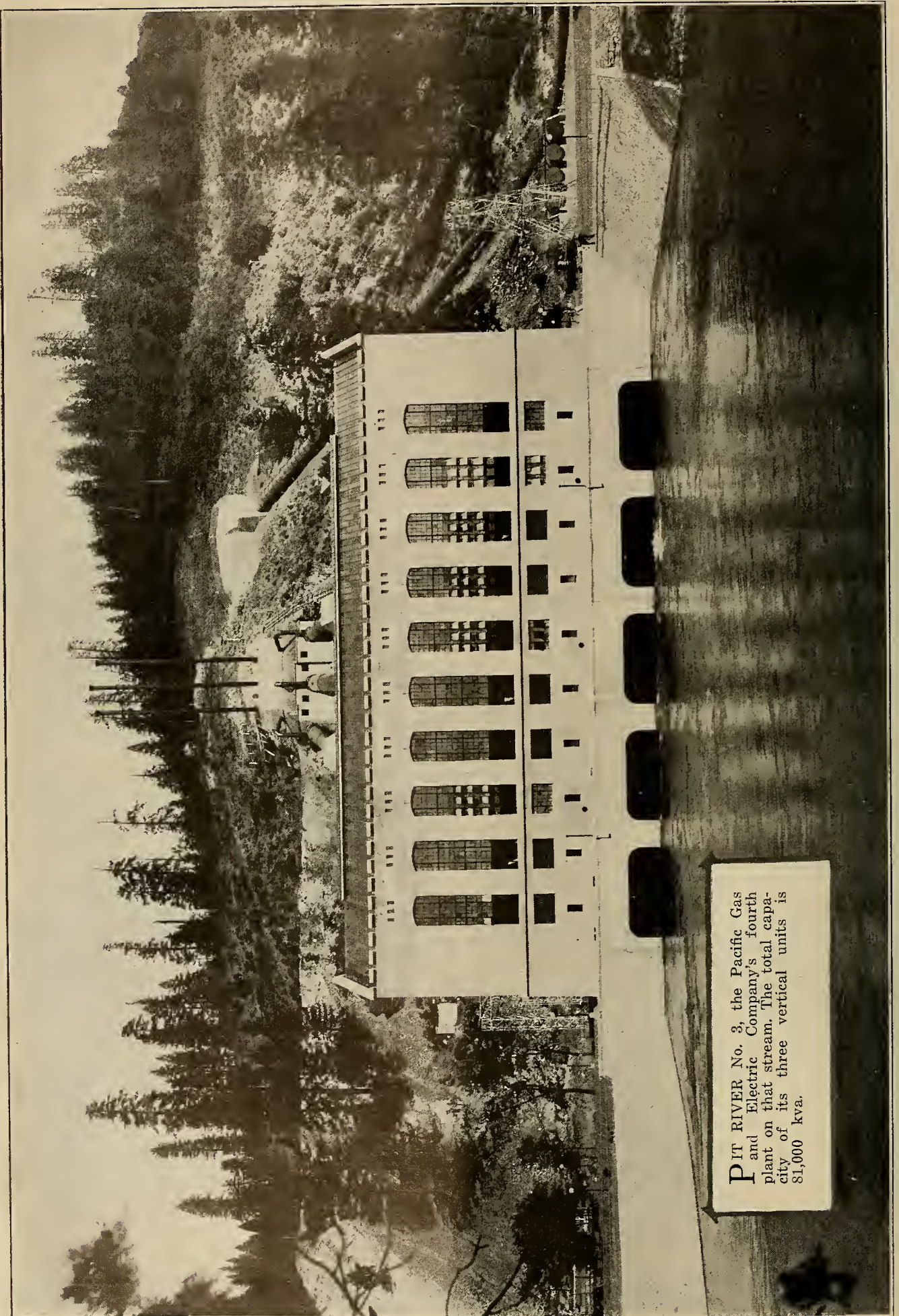
WHILE the wave of general prosperity was responsible for an increase in the number of consumers and a greater use of electric energy, companies were not content with natural growth alone, but undertook extensive commercial department campaigns which included every type of load-building device and every class of consumer. To cite one accomplishment in this direction, the number of domestic cooking consumers increased 40 per cent during 1925.

HOWEVER, the greatest development of a commercial nature during this year was the awakening to realization on the part of those California companies which for years have abstained from merchandising any device smaller than electric range or water heater, that building a domestic load is a power-company job. One commercial executive aptly states this new position in the following words:

This company is firmly convinced of the correctness of the policy of central-station merchandising provided it is done on a proper basis. There can be no argument as to the desirability of placing appliances and lighting load on the line of any company, for it produces additional revenue with very little, if any, capital expenditure. The placing of this additional load is strictly a central-station job, for we cannot expect any other agency to have the same interest in it as we should have, as they do not have the same incentive.

FROM a public-relations standpoint the efforts of the Western companies have not lagged. More and more customer-owners have been added to the list of stockholders. There has been a greater awakening to the value of the work of women in the industry and women's committees are functioning in nearly every state. Although the political horizon shows signs of a renewed storm during the fall, especially in California, Oregon and Washington, plans are being worked out which, it is hoped, will still for all time the voice of the political proponents of state ownership.

SO, with a new year under way, the central stations of the West have placed their shoulders to the wheel, intent upon the task of proving to the public that electricity is the cheapest and most useful agent known to mankind and that it has achieved this distinction under the wise guidance and energetic efforts of private initiative and enterprise.



PIT RIVER No. 3, the Pacific Gas and Electric Company's fourth plant on that stream. The total capacity of its three vertical units is 81,000 kva.

During 1925 Central-Station Construction Exceeds Any Previous Year

CENTRAL - STATION power-plant construction during 1925 has been responsible for the addition of 401,125 kva. to the installed generator rating of the eleven Western states, bringing the total as of Jan. 1, 1926, to 3,368,723 kva., or a growth of 13.5 per cent for the year. Of the increase for the past year 314,625 kva. was in hydroelectric plants and 87,500 kva. in steam electric stations. The increase for the year compares with 382,723 kva. installed during 1924. The total power-company construction budget for the year is estimated to have been \$127,610,000, of which \$74,250,000 was spent for power-plant construction, \$15,660,000 for new transmission lines and \$37,700,000 for distribution facilities.

From present indications 1926 will fall somewhat below 1925 in total capacity added although there will be more construction in process. Study of projects under way at the present time shows that approximately 339,550 kva. will be installed during the present year with 194,550 kva. in hydro plants and 145,000 kva. in steam plants. The 1926 construction budget is estimated to be \$153,450,000, the increase over 1925 being due largely to increased expenditures for transmission and distribution facilities. Not less than \$29,300,000 will be spent on new transmission lines during the year and \$42,200,000 on new distribution facilities.

Briefly summarized, the construction program for the central stations of the eleven Western states for the five-year period of 1922-1926, inclusive, is shown in the following table:

Year	Hydro (kva.)	Steam (Kva.)
1922	138,675	No record
1923	185,500	No record
1924	243,223	139,500
1925	314,625	87,500
1926	194,550	145,000

Total steam and hydroelectric.....1,448,573 kva.

Average per year for five-year period.... 289,714 kva.

The major portion of the new hydro capacity is in five large new plants with the balance comprising new units in three existing plants, together with four small plants, two of which were rebuilt. The most important project of the year was the Pacific Gas and Electric Company's new 81,000-kva. Pit No. 3 plant in Northern California (see Journal

POWER companies of the eleven Western states added 401,125 kva. in new capacity to their systems during 1925 as against 382,723 kva. in 1924. Construction budget for 1926 is estimated to be \$153,450,000. Transmission-line construction exceeded any previous year with 1,865.9 miles of new lines, ranging between 30 and 220-kv., completed or under construction.

of Electricity, Aug. 15, 1925, pp. 119-137). This company is going ahead with work on its Pit No. 4 power house, having started construction of the necessary tunnels during the past year.

Next in importance among the new hydro generating stations is the Moccasin power house of the City of San Francisco with an installed capacity of 80,000 kw. (Journal of Electricity, July 1, 1925, pp. 25-30). This plant was placed in operation in

August 1925, after an unfortunate penstock break which incapacitated the station for several weeks. Since that time, however, it has been operating highly satisfactorily, its output being distributed over the lines of the Pacific Gas and Electric Company.

A third California development of importance is the 30,000-kw. Copco No. 2 plant of The California Oregon Power Company on the Klamath River in northern California (Journal of Electricity, Nov. 15, 1925, pp. 365-371). This plant is the second of a chain to be constructed on that stream. A portion of its output is being distributed in California by the Pacific Gas and Electric Company.

The remaining hydro construction of any importance in California completed during the year was the installation of additional units in two of its Big Creek plants by the Southern California Edison Company. A 25,000-kw. unit was placed in operation in Big Creek No. 1, bringing the capacity of that station to its ultimate of 73,000 kw. An additional 16,000-kw. unit also was installed in Big Creek No. 2, bringing the capacity of that station to 64,000 kw.

In the Pacific Northwest the Puget Sound Power & Light Company completed its Baker River plant which has an installed capacity of 39,000 kva. (Journal of Electricity, Dec. 15, 1925, pp. 440-451). The plant was constructed to serve the northern district of that company's territory, and as a result of its construction a territory which was partially served with energy purchased from Canada now is served with energy generated by the company.

Another important Northwest development is the 12,500-kw. Mystic Lake plant of the Montana Power Company which involves several unique features (Journal of Electricity, Jan. 15, 1926, pp. 43-49). This development is unusual because it

Some Additions to Hydroelectric Generating

COMPANY	PLANT	LOCATION	DAMS			CANALS AND TUNNELS			PENSTOCK	
			Type	Reservoir Capacity (Acre-ft.)	Height (Ft.)	Type	Dia. (Ft.)	Length (Ft.)	Dia.	Length (Ft.)
(1) British Columbia Electric Railway Company, Ltd.	Stave Falls (Fifth Unit)	Stave Falls, B.C.	Concrete	471,000	75				20-13'	324
(2) British Columbia Electric Railway Company, Ltd.	Alouette	35 Mi. east of Vancouver	Earth Fill	170,000	63	Tunnel	12x16	3,550	13' 12"	
(3) British Columbia Electric Railway Company, Ltd.	Bridge River	Seton Lake, B.C.					13	13,200		2,100
(4) The California Oregon Power Company	Copco No. 2	Klamath River, Calif.	Gravity		34	Tunnels Wd. Pipe	16 16	3,545 1,318	13½'	403
(5) Chelan Electric Co.		Lake Chelan								
(6) City of San Francisco	Moccasin	Tuolumne River, Calif.	Gravity Arch	206,000	344	Concertd. Tunnel	10¼ 13½	18.8 miles	104" 54"	
(7) City of Seattle	Ruby	Skagit River, Wash.	Arch	1,300,000	480	Concertd. Tunnel	28	18,500		
(8) City of Tacoma	Cushman No. 1	Lake Cushman, Wash.	Constant Angle Arch	450,000	285	Concertd. Tunnel	17	800	10'	80
(9) City of Tacoma	Cushman No. 2	Lake Cushman, Wash.	Constant Angle Arch	6,000	180	Concertd.		9,000		
(10) Feather River Power Company	Buck's Creek	Feather River	Rock Fill 2-Arch	103,000	115 85		6x8 8x8	5,700 9,670	54" 36"	4,715
(11) Great Western Power Company	Caribou (Fourth Unit)	Feather River, Calif.	Hydraulic Fill	1,300,000	45 Addtl.				66-42"	
(12) Inland Power & Light Company	Lewiston	Lewiston, Ida.								
(13) Los Angeles Bureau of Power & Light	Big Pine No. 3	Big Pine, Calif.	Diversion				44"	4,730	30-22"	8,500
(14) Merced Irrigation District	Exchequer	Merced River, Calif.	Constant Angle Arch	280,000	330				96"	200
(15) Montana Power Company	Mystic Lake	West Rosebud River, Mont.		20,000	25	Tunnel Wd. Pipe	56"	1,000 9,000	48" 44"-42"	2,800
(16) Northwestern Electric Company	Yale	Lewis River, Wash.	Gravity	36,000	160	Tunnel	20	500	13' 13'	180-210
(17) Pacific Gas and Electric Company	Pit No. 3	Pit River, Calif.	Gravity	32,300	110	Concertd. Tunnel	19	20,998	129-108"	550
(18) Pacific Gas and Electric Company	Melones	Stanislaus River, Calif.	Concrete Arch	112,500	210	Pres. Tunnel	12	4,800	81½-71½"	150
(19) Pacific Gas and Electric Company	Pit No. 4	Pit River, Calif.	Diversion	1,550	40	Concertd. Tunnel	19	300		
(20) Pacific Power & Light Company	Deschutes	Deschutes River, Ore.								
(21) Puget Sound Power & Light Company	Baker River	Baker River, Wash.	Arch and Gravity	70,000	250	Concertd. Tunnel	22	1,600	78"	150
(22) Sacramento Municipal Utility District	Big Bend	Silver Creek, Calif.		45,000	130					
(23) Salt River Valley Water Users' Association	Horse Mesa	Salt River, Ariz.	Arch	300,000	300				10'	350
(24) Salt River Valley Water Users' Association	Mormon Flats	Salt River, Ariz.	Arch	90,000	150				8'	50
(25) San Joaquin Light & Power Corporation	Balch	Kings River, Calif.	Concrete	100	50	Tunnel	12x12	19,600	54-32"	4,842
(26) Southern California Edison Company	Big Creek No. 1	Big Creek, Calif.							54-24"	
(27) Southern California Edison Company	Big Creek No. 2	Big Creek, Calif.							42-24"	
(28) Southern California Edison Company	Big Creek No. 2-A	Big Creek, Calif.	Multpl. Arch	135,000	190		8x11	13,600	66-44"	6,500
(29) The Southern Sierras Power Company	Forest Home	San Bernardino County, Calif.	Concrete	Diversion		Wood Pipe	1-2½	29,550	24-18"	6,064
(30) Turlock Irrigation District	La Grange	Tuolumne River, Calif.	Gravity	Diversion			14		7-5'	200
(31) Utah Power & Light Company	Cutler	Bear River, Utah	Gravity Arch	17,000	112	Steel Pipe	18	1,100	16-14'	117
(32) Utah Power & Light Company	Ashton	Snake River, Ida.	Rock Fill		50					
(33) Washington Irrigation & Development Company	Priest Rapids	Columbia River, Wash.		85,000						

*Existing structures will be used.

†Abbreviations used are: A.-C., Allis-Chalmers Manufacturing Company; G. E., General Electric Company; West., Westinghouse Electric & Manufacturing Company; Pelt., Pelton Water Wheel Company; I. P. M., I. P. Morris Department William Cramp & Sons Ship & Engine Building Company; Worth., Worthington Pump & Machinery Corporation; W. S. M., Wellman-Seaver-Morgan Company; S. M. S., S. Morgan Smith Company.

Plants in the Eleven Western States 1925-1926

D (Ft.)	PRIME MOVERS			GENERATING UNITS			PLANT CAPACITY (kw.)		TRANSFORMERS	TRANSMISSION LINES			PRESENT STAGE OF DEVELOPMENT	
	Effective	No.	Capacity (hp.)	Maker	No	Capacity (kva.)	Maker	Present or Proposed		Ultimate	Length (mi.)	Voltage (kv.)			Type
115 Av.	1	15,000	A.-C.†	1	13,125	G.E.†	59,000	59,000	3-5,500 Kva. G.E.	•	•	•	Completed Sept., 1925	(1)
133 Av.	1	12,500	.....	1	10,000	.....	9,000	9,000	3-3,000 Kva.	10½	60	Wood Pole	To be completed, 1927	(2)
1,150	2	27,000	.....	2	22,500	.....	40,000	520,000	.....	130	165	.....	Proposed	(3)
140	2	20,000	A.-C.	2	15,000	West.	30,000	30,000	3-20,000 Kva. 6,600/66,000-110,000	77½	110	Wood Pole	Completed July, 1925.	(4)
.....	5	25,000	.....	5	20,000	.....	.....	100,000	.....	.....	.....	.....	Proposed	(5)
1,250	4	25,000	Pelt.	4	20,000	G.E.	80,000	120,000	13-6,667 Kva. West. 11,000/154,000 volt	98½	154	Steel Tower	Completed Aug. 1925	(6)
.....	.....	.....	.....	.....	.....	.....	.....	250,000	.....	.....	.....	.....	Proposed	(7)
231-120	2	25,000	A.-C.	2	30,000	A.-C.	40,000	120,000	6-10,000 Kva. A.-C. 13,200/110,000	44	110	Wood Pole	Completed Jan. 1925	(8)
.....	.....	.....	.....	.....	.....	.....	.....	112,000	.....	.....	.....	.....	Proposed	(9)
2,368	2	30,000	.....	2	25,000	.....	40,000	40,000	7-8,333 Kva. 11,000/240,000 volt	108	220	Steel Tower	To be completed Aug. 1927	(10)
1,074	2	15,000	.....	1	22,000	.....	88,000	135,000	3-7,500 Kva.	•	•	•	Proposed	(11)
.....	.....	.....	.....	.....	.....	.....	.....	10,000	.....	.....	.....	.....	Proposed	(12)
1,116	1	4,500	Pelt.	1	3,200	G.E.	3,200	3,200	4-1,333 Kva. G.E.	4	3.3	Wood Pole	Completed 1925	(13)
260 Av.	2	24,500	Pelt-Morris	2	15,625	West.	30,000	30,000	3-10,400 Kva. G.E. 6,600/120,000 volt	20	110	Steel Tower	To be completed May 1926	(14)
1,050	2	7,500	Pelt.	2	6,250	West.	12,500	12,500	2-6,000 Kva. West.	27	51	Wood Pole	Completed March 1925	(15)
140	2	20,000	.....	2	18,000	.....	30,000	45,000	6-6,000 Kva. 11,000/66,000	40	66	.....	Proposed	(16)
280	3	33,000	Pelt.	3	27,000	G.E.	75,000	75,000	9-9,000 Kva. 11,000/110,000-220,000	8½	220	Steel Tower	Completed July 1925	(17)
228	2	17,000	.....	2	13,500	.....	27,000	27,000	4-9,000 Kva.	7½	104	.....	To be completed Jan. 1927	(18)
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Construction of Tunnels started 1925	(19)
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Proposed	(20)
.....	2	20,000	A.-C.	2	19,500	G.E.	30,000	60,000	7-6,667 Kva. G.E. 6,600/110,000	66½	110	Wood Pole	Completed Nov. 1925	(21)
.....	.....	.....	.....	.....	.....	.....	.....	30,000	.....	.....	.....	.....	Proposed	(22)
264	3	15,280	S.M.S.	3	11,100	G.E.	34,000	34,000	10-3,700 Kva. G.E. 11,000/110,000	4	110	Steel Tower	Construction started 1925	(23)
.....	2	10,000	S.M.S.	2	8,500	West.	14,000	14,000	4-3,000 Kva. West. 11,000/110,000 volt	1	.....	.....	To be completed Apr. 1926	(24)
2,243	2	20,000	A.-C.	1	33,000	G.E.	31,000	124,000	4-11,000 Kva. G.E. 13,200/132,000	39	132	Steel Tower	Construction started 1925	(25)
.....	1	35,000	Pelt.	1	25,000	West.	73,000	73,000	3-9,333 Kva. G.E. 11,000/150,000	•	•	•	Completed June 1925	(26)
.....	1	20,000	Pelt.	1	16,000	West.	64,000	64,000	3-5,833 Kva. G.E. 6,600/150,000	•	•	•	Completed April 1925	(27)
2,290	2	60,000	.....	2	40,000 kw.	.....	80,000	80,000	3-37,500 Kva. 11,000/220,000 volt	230	220	Steel Tower	To be completed May 1925	(28)
1,951	1	2,800	.....	1	5,000	.....	2,000	2,000	3-1,500 Kva.	8.2	87	Wood Pole	Completed 1925	(29)
115	1	1,350	S.M.S.	2	500	West.	4,000	8,000	4,000 Kva. A.-C. 4,000/73,000 volt	1½	73	.....	Completed 1925	(30)
.....	1	4,000	A.-C.	1	3,000	A.-C.	.....	.....	.....	.....	.....	.....	.....	.....
124	2	21,500	I.P.M.	2	15,000	G.E.	30,000	30,000	6,600/130,000 volt G.E.	80	130	.....	To be completed 1926	(31)
47	2	3,000	S.M.S.	2	2,000	G.E.	5,800	5,800	6,000 Kva. 2,300/44,000 volt	15	44	.....	Completed 1925	(32)
.....	1	3,150	S.M.S.	1	1,500	G.E.	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	250,000	562,500	.....	.....	.....	.....	Proposed	(33)

Some Additions to Steam Electric Generati

COMPANY	PLANT	LOCATION	BOILERS				FUEL	PRIME MOVERS	
			No.	Type	Capacity (hp.)	Maker		No.	Capacity (hp.)
(1) Grays Harbor Railway & Light Company	Station No. 1 (Adtl. Unit)	Aberdeen, Wash.	1	.....	1,090	C.-H.†	Hogged Fuel	1	6,750
(2) Hawaiian Electric Company	.....	Honolulu, T. H.	2	Water Tube	825	.....	Oil	1	15,000
(3) Los Angeles Bureau of Power & Light	.....	Los Angeles, Calif.	3	Water Tube	.....	.....	Oil & Gas	1	36,000
(4) Los Angeles Gas & Electric Corporation	Seal Beach	Seal Beach, Calif.	3	Water Tube	2,545	B.&W.	Oil & Gas	1	48,000
(5) Pasadena Municipal Light & Power Department	Glenarm St., 3rd Unit	Pasadena	No Addtl.	.....	.....	.....	Gas & Oil	1	20,000
(6) Pacific Power & Light Company	Young's Bay	Astoria, Ore.	.....	.....	.....	.....	Hogged Fuel	1	7,500
(7) Public Service Company of Colorado	Valmont	Boulder, Colo.	No Addtl.	.....	.....	.....	Pulverized Coal	1	30,000
(8) San Diego Consolidated Gas & Electric Company	Station B, 3rd Unit	San Diego, Calif.	1	.....	1,166	.....	Oil	1	20,000
(9) Southern California Edison Company	Long Beach No. 2 3rd Unit	Long Beach, Calif.	7	.....	1,500	Con.	Oil & Gas	1	62,500
(10) Southern Sierras Power Company	San Bernardino	San Bernardino, Calif.	No Addtl.	.....	.....	.....	Oil	1	6,700

†Abbreviations:—C.-H., Casey-Hedges Company; B. & W., Babcock & Wilcox Company; Con., Connelly Boiler Company; West., Westinghouse Electric & Manufacturing Company; G. E., General Electric Company; A.-C., Allis-Chalmers Manufacturing Company.

taps a mountain lake beneath its surface for its water supply. In British Columbia, the B.C. Electric Railway Company, Ltd. added the fifth 13,125 kva. unit to its Stave Falls plant, bringing the capacity of this station to 59,000 kw.

The balance of the hydro added during the year was in four small plants, details of which are given in the accompanying table.

Many notable plants are under construction in the Western states at the present time. As this issue goes to press, work is almost completed in the City of Tacoma's Cushman No. 1 plant, which has an installed capacity of 60,000 kva. A description of this project, which has at its disposal 450,000 acre-ft. of reservoir capacity with only a 285-ft. dam, will appear in an early issue.

High-Head Plants

Two extremely high-head plants are under construction in California at the present time. One is the Buck's Creek plant of the Feather River Power Company, which will utilize the waters of Buck's Creek, a tributary of the Feather River, under a static head of 2,548 ft. The output of this 40,000-kw. plant is sold to the Great Western Power Company under an agreement which will result in the transfer of ownership of the station to that company at the end of thirty-five years.

The second high-head development is the Balch plant of the San Joaquin Light & Power Corporation on the Kings River which will generate initially 31,000 kw. under a static head of 2,381 ft. This plant has an ultimate capacity of 124,000 kw. Before the close of the present year active construction will have commenced on the Big Creek No. 2-A plant of the Southern California Edison Company, where 80,000 kw. will be generated under a head of 2,419 ft. Preliminary plans for this station call for two 60,000-hp. impulse wheels, which will establish a new record for size and head.

Work is progressing satisfactorily on two other

important California projects, the Melones plant of the Pacific Gas and Electric Company and the Exchequer plant of the Merced Irrigation District. The former plant is on the Stanislaus River in central California and will have a capacity of 27,000 kw. It is being constructed under an agreement with the Oakdale and South San Joaquin Irrigation District whereby the power company will utilize water from an irrigation development at a flat fee per acre-foot. This plant will be completed early in 1927. The Exchequer plant is an integral part of an important irrigation project in the San Joaquin Valley. It will have a capacity of 30,000 kw. Its output has been sold to the San Joaquin Light & Power Corporation.

In the Intermountain district the Utah Power & Light Company is completing its Cutler plant on the Bear River. This station will be the lowest of a chain which completely utilizes the waters of that stream. It has a capacity of 30,000 kw. One of its unique features is the 18-ft. steel pipeline which carries water from the dam to the power house.

With the exception of the Alouette plant of the B.C. Electric Railway Company, Ltd., there are no developments under way in the Pacific Northwest although several are contemplated. One of three projects will be undertaken shortly by the Pacific Power & Light Company or its associated companies. Three projects are available—the Deschutes development on the Deschutes River in Oregon, the Yale project of the Northwestern Electric Company on the Lewis River in Washington, and the Lewiston project of the Inland Power & Light Company at Lewiston, Idaho.

An announcement of details regarding the Lake Chelan project of the Chelan Electric Company, recently purchased by The Washington Water Power Company, is expected at any time. Five 20,000-kw. units are proposed for this plant, the output from which will be used to supply energy for the elec-

tions in the Eleven Western States, 1925-1926

GENERATORS		PLANT CAPACITY		TRANSFORMERS	TRANSMISSION LINE			PRESENT STATUS
Capacity (Kva.)	Maker	Present or Proposed	Ultimate		Length (mi.)	Voltage (Kv.)	Type	
5,000	West	6,900	6,900	3-1,667 Kva. G.E. 4,150/26,400 volt				Completed 1925 (1)
12,500	West	22,500	37,500					Completed 1925 (2)
31,250		30,000		3-10,500 Kva.				Proposed 1926 (3)
30,000	West	30,000	200,000	4-12,500 Kva. West 13,200/110,000 volt	25	110	Steel Tower	Completed June 1925 (4)
15,000		16,000	31,000					Proposed 1926 (5)
6,250	G.E.	5,000	8,000					Completed March 1925 (6)
25,000	G.E.	25,000	100,000	No Addtl.				To be completed July 1926 (7)
18,750		15,000	45,000	3-2,000 Kva. G.E.				Proposed 1926 (8)
50,000	G.E.	50,000	120,000	4-20,000 Kva. G.E. 11,000/60,000	12	60		To be completed Aug. 1926 (9)
5,000	A.-C.	5,000	10,000	No Addtl.				To be completed 1926 (10)

trified section of the Great Northern Railway over the Cascade Mountains.

Two major developments of utmost importance to the West are held in abeyance at the present time—the Colorado River and the Priest Rapids project on the Columbia River. For the present there seems little likelihood of construction of any project on the Colorado as Arizona has still to reach an agreement with other basin states. Moreover, recent developments in Congress seem to preclude any real action. The license to the Washington Irrigation and Development Company for the Priest Rapids project calls for active construction to be in progress not later than March, 1927, and a definite announcement regarding the plans of this company may be expected in the spring.

Two important hydraulic developments connected with hydroelectric projects are in process in California. The Great Western Power Company is raising the height of its Big Meadows dam at Lake Almanor 45 ft., giving that reservoir a capacity in excess of 1,000,000 acre-ft. This water will be used in the Caribou and Big Bend power houses on the Feather River and in other plants to be constructed at a later date. The Southern California Edison Company has crews actively at work on the Shaver Lake tunnel, which will carry excess water from Huntington to Shaver Lake where it will be utilized in the Big Creek 2-A power house.

Steam Plant Construction

The only important steam plant completed during 1925 was the Seal Beach station of the Los Angeles Gas & Electric Corporation. This 30,000-kw. station has a future capacity of 200,000 kw. and will require an additional unit not later than 1927. A 12,500-kw. unit was installed in the Honolulu steam plant of the Hawaiian Electric Company during the year.

Work is under way on the installation of a 50,000-kw. unit in the Long Beach No. 2 plant of

the Southern California Edison Company. This will be the largest steam unit west of the Mississippi and will raise the capacity of the station to 120,000 kw.

In Colorado The Public Service Company is placing a third unit in the Valmont steam plant at Boulder. The new unit will have a capacity of 25,000 kw.

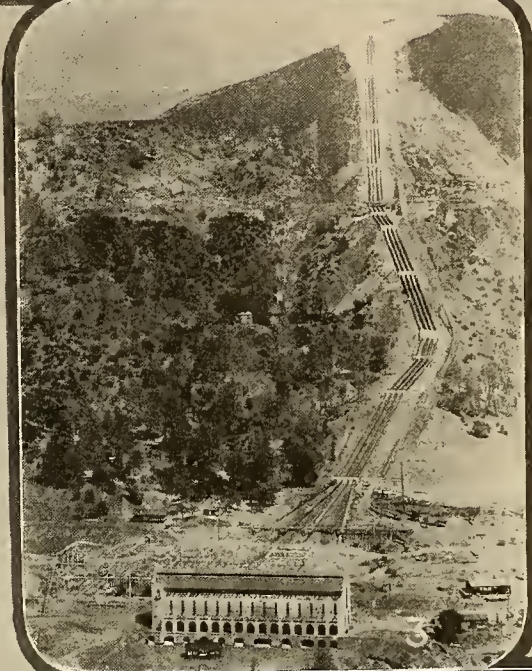
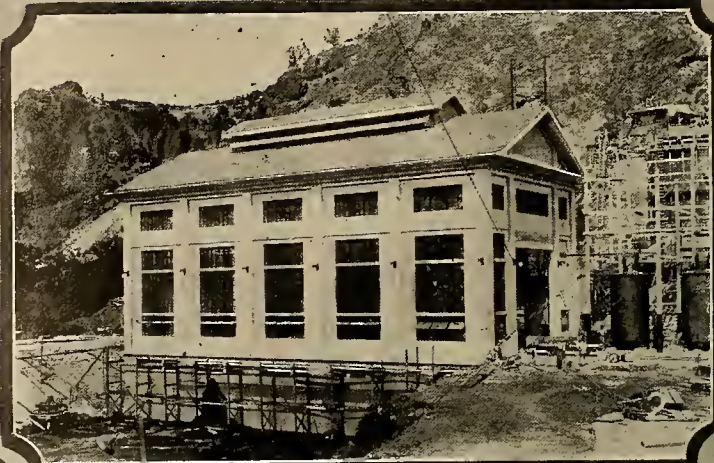
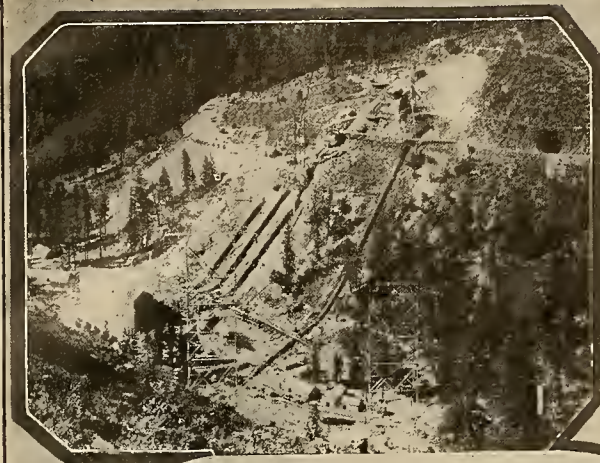
Three steam developments are proposed for the year. The Los Angeles Bureau of Power & Light contemplates the erection of a 30,000-kw. stand-by plant in the Los Angeles harbor district during the year. The San Diego Consolidated Gas & Electric Company will install a 15,000-kw. unit in Station B at San Diego. The Pasadena Municipal Light & Power Department also proposes to install an additional 15,000-kw. unit in its Glenarm Street station in Pasadena.

Transmission Line Construction

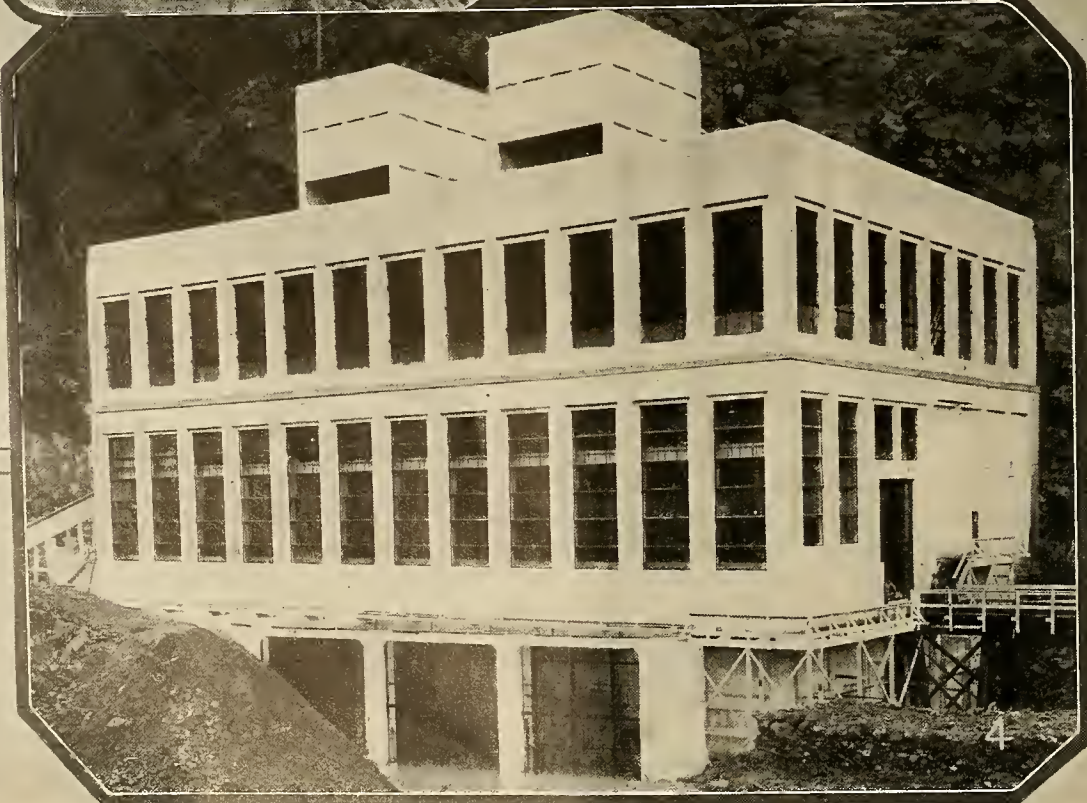
During the year just closed Western central stations completed or had under construction 1,865.9 circuit miles of transmission lines ranging from 30 to 220 kv., the major portion of which exceeded 100 kv. The classification follows:

30 to 50 kv.	183.7 circuit miles
50 to 75 kv.	483.7 circuit miles
75 to 100 kv.	7.2 circuit miles
100 to 165 kv.	818.8 circuit miles
220 kv.	372.5 circuit miles

Two important additions to California's 220-kv. network are under construction. The Great Western Power Company is constructing a 103-mile line from Brighton substation, near Sacramento, to Merced, which will tie its system with that of the San Joaquin Light & Power Corporation. This line will be completed early in 1926. Work is progressing on the Southern California Edison Company's new Vincent line, which will connect Los Angeles with the Big Creek plants, giving the company



FOUR of the major hydroelectric plants completed in the eleven Western states during 1925 are shown on this page. No. 1 is the Pit No. 3 plant of the Pacific Gas and Electric Company, fourth of a series of stations being erected on Pit River. It has a capacity of 81,000 kva. developed under a head of 280 ft. No. 2 shows the Copco No. 2 power house of The California Oregon Power Company on the Klamath River in northern California. It has a capacity of 30,000 kva. No. 3 is the 80,000-kva. Moccasin plant of the City of San Francisco, a part of the Hetch Hetchy development. No. 4 shows the Baker River plant of the Puget Sound Power & Light Company on Baker River in western Washington. Its capacity is 39,000 kva.





One of the towers on the new Kings River line of the San Joaquin Light & Power Corporation.

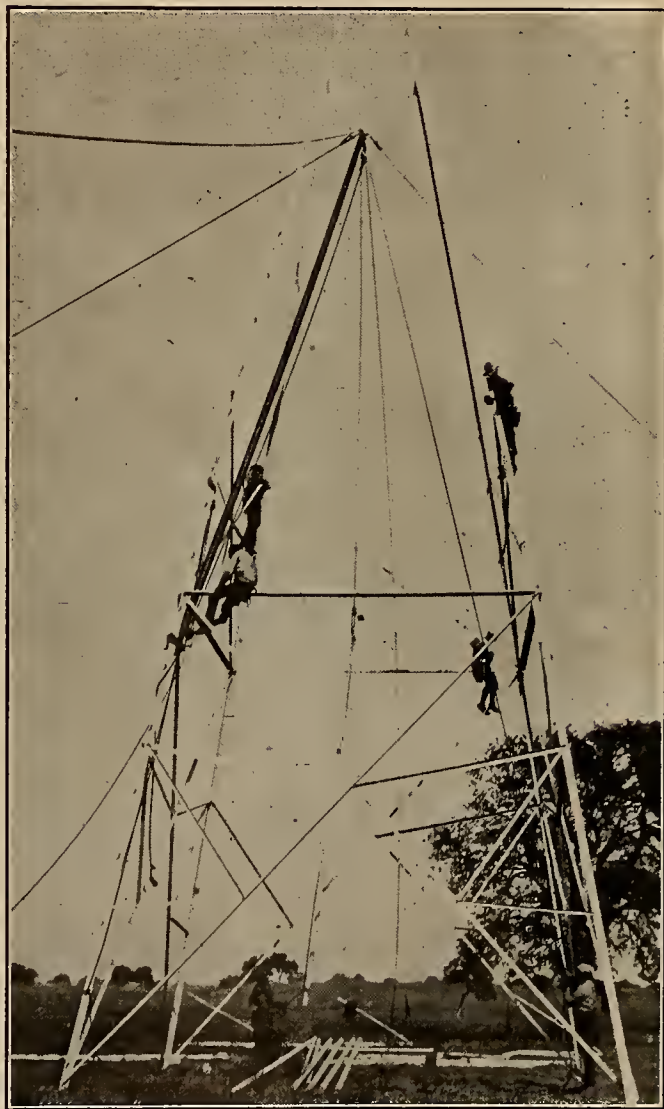
three 220-kv. circuits. Half of the line, from Los Angeles to Magunden substation in the San Joaquin Valley, will be completed in 1927 and the balance when the new Big Creek 2-A plant is ready in 1928. Two extensions to its 220-kv. system have been constructed by the Pacific Gas and Electric Company. One line connects Pit No. 3 with the system, and the other extends from Vaca-Dixon substation to the new Contra Costa substation. This latter line crosses both the San Joaquin and Sacramento Rivers in the Delta region and sets new records for high towers at those crossings.

In the Northwest both The Washington Water Power Company and the Puget Sound Power & Light Company made important extensions to their networks with 110 and 60-kv. lines.

Two lines of considerable size are proposed for the present year. The Los Angeles Bureau of Power and Light proposes to erect a two-circuit 110-kv. line from its new steam plant in the harbor district to Los Angeles, and The Washington Water Power

Company has under consideration 70 miles of 110-kv. line from Fairfield, Wash., to Wallace, Idaho.

During the past year an important gap in the Pacific Coast interconnected system was closed when the lines of the Portland Electric Power Company and the Mountain States Power Company were interconnected. The tie is between Independence and Salem, Ore. As a result, the hydroelectric systems in the vicinity of Portland now are connected with the California systems over the lines of the Mountain States Power Company and The California Oregon Power Company. But one gap



Erecting a tower on the Brighton-Merced 220-kv. tie line between the systems of the Great Western Power Company and the San Joaquin Light & Power Corporation.

now remains between the Washington-Montana interconnected system and the Oregon-California systems. With the construction of a line connecting its eastern and western divisions, the Pacific Power & Light Company will tie the two together along the Columbia River. Or a line can be built between the system of the Northwestern Electric Company and the Puget Sound Power & Light Company in southern Washington to accomplish the same purpose.

Some Additions to Transmission Systems in the Eleven Western States 1925-1926

COMPANY	LOCATION	Length (Miles)	Voltage (Kv.)	No. of Circuits	SUPPORTS	CONDUCTOR	INSULATORS	SPANS		STATUS
								Aver. (ft.)	Max. (ft.)	
Coast Counties Gas & Electric Company	Morgan Hill to Watsonville, Calif.	20	60	1	Wood Pole	3/0 Copper	Pin type	264	1,200	To be completed 1926
Coast Valleys Gas & Electric Company	New Idria Mine to Maltby Magnesite Mine	3.5	30	1	Wood Pole	No. 4 Copper	Pin type Locke	350	.....	Completed 1925
City of San Francisco	Moecasio to Newark Substation, Calif.	98.5	154	2	Steel Tower P.C.S.†	90% 250,000 c.m. A.C.S.R. 10% 345,000 c.m. Copper An.	10-601 West	900	2,400	Completed June 1925
Great Western Power Company of California	Napa to Santa Rosa, Calif.	43	44	1	Wood Pole	No. 1 Copper 25 mi. No. 4 Copper 18 mi.	Pin type O.B.	350	624	Completed 1925
Great Western Power Company of California	Brighton to Merced, Calif.	103	220	1 2 U.H.	Steel Tower P.C.S.	795,000 c.m. A.C.S.R.	14-Suspension Locke	831	1,331	To be completed 1926
Inland Power & Light Company*	Hanford to Taunton, Wash.	15.3	110	1	Wood Pole B.J.C.	1/0 Str. Copper An.	10" Disc. 6 Unit West.	500	1,830	Completed 1925
Inland Power & Light Company*	Pomeroy to Clarkston, Wash.	29.5	66	1	Wood Pole W.S.C.	1/0 Str. Copper An.	Pin & 10" Disc. Locke	250	1,370	Completed 1925
Los Angeles Bureau of Power & Light	Los Angeles and Harbor Dist. Calif.	25	110	2	Steel Tower	Copper	.....	.....	.....	Proposed 1926
Los Angeles Gas & Electric Corporation	Seal Beach to Los Angeles, Calif.	25	110	2	Steel Towers P.C.S.	300,000 c.m. Copper An.	Suspension West	800	905	Completed 1925
Montana Power Company	Edgar to Billings, Mont.	28.2	50	1	Wood Pole	91,665 c.m. Str. Copper	Pin type Pyrex	278	840	Completed 1925
Mountain States Power Company	Albany to Springfield, Ore.	44.2	66	2	Wood Pole	2/0 Copper An.	Pin Type O.B.	300	.....	To be completed 1926
Mountain States Power Company	Independence to Salem, Ore.	10.8	66	1	Wood Pole	2/0 Copper An.	Pin type O.B.	300	.....	Completed 1925
Mountain States Power Company	Albany to Corvallis, Ore.	11.5	66	2	Wood Pole	No. 2 Str. Copper An.	Pin type O.B.	300	.....	Completed 1925
Pacific Gas & Electric Company	Cooley Landing to Martine Sta., Calif.	25.2	110	2	Steel Towers P.C.S.	250,000 c.m. Str. Copper	8-Suspension	800	.....	Completed 1925
Pacific Gas & Electric Company	Pit 3 to Pit 1&2 lines, Calif.	8.5	220	2	Steel Towers P.C.S.	518,000 c.m. A.C.S.R.	13-Suspension	700	2,400	Completed 1925
Pacific Gas & Electric Company	Mt. View Sub. to Murietta Pt., Calif.	24	60	1	Wood Poles	3/0 Str. Copper	Pin type	200	2,500	Completed 1925
Pacific Gas & Electric Company	Lines 1&2, So. San Francisco	3.5	110	2	Steel Tower P.C.S.	4/0 Str. Copper	8-Suspension	800	.....	Completed 1925
Pacific Gas & Electric Company	Delta to Shasta Sub., Calif.	42	110	1	Poles & Towers	250,000 c.m. Str. Copper	8-Suspension	600	1,700	Completed 1925
Pacific Gas & Electric Company	Sierra Lines 1&2 So. San Francisco	3	110	2	Steel Towers P.C.S.	2/0 Str. Copper	7-Suspension	800	.....	Completed 1925
Pacific Gas & Electric Company	So. San Francisco to Martin Sta.	2.7	110	2	Steel Towers P.C.S.	4/0 Str. Copper	8-Suspension	800	.....	Completed 1925
Pacific Gas & Electric Company	Vaca-Dixon Sub. to Contra Costa Sub.	14.5	220	2	Steel Towers P.C.S.	500,000 c.m. Copper	13-Suspension	800	4,000	To be completed 1926
Portland Electric Power Company	Sta. P, Oak Grove & Faraday, Ore.	18.7	57.1	1	Steel Towers P.C.S.	250,000 c.m. Copper	7-10" Susp. O.B.	600	1,600	2nd Circuit added 1925
Portland Electric Power Company	Lents Junct. to Sellwood, Ore.	5.3	57.1	1	Steel Towers Mill	250,000 c.m. Copper	4-10" Susp. O.B.	500	560	2nd Circuit added 1925
Portland Electric Power Company	Newberg to West Salem, Ore.	30.5	57	1	Wood Pole	2/0 Str. Copper	Pin type O.B.	200	.....	Completed 1925
Portland Electric Power Company	Boring to Morrow, Ore.	10.5	57.1	1	Steel Tower Mill	250,000 c.m. Copper	10"-Suspension O.B.	500	560	2nd Circuit completed 1925
Portland Electric Power Company	Faraday to River Mill, Ore.	3.2	57.1	2	Wood Pole	1/0 Str. Copper	Pin type O.B.	100	.....	Completed 1925
Portland Electric Power Company	Boring, Linneman, Sycamore & Lents Junct., Ore.	10.4	57.1	1	Wood Pole	2/0 Str. Copper	Pin type O.B.	200	.....	Completed 1925
Portland Electric Power Company	Sta. L. to Oaks, Ore.	.....	57.1	1	Steel Tower Mill	250,000 c.m. Copper	4-10" Susp. O.B.	500	.....	Under construction
Puget Sound Power & Light Company	Beverly Park Sub. to Canal Sub., Wash.	22	55	1	Wood Pole	Al. 4/0 Copper equivalent	No. 82-A Pinco	210	300	Completed 1925
Puget Sound Power & Light Company	Sedro-Woolley Sub. to Bellingham, Wash.	23.8	55	1	Wood Pole	4/0 Str. Copper	No. 82-A Pinco	300	.....	Completed 1925
Puget Sound Power & Light Company	Baker River to Beverly Park Sub., Wash.	66.5	110	1	Wood Pole	4/0 Str. Copper	6-No. 1166 Thomas Suspension	450	1,780	Completed 1925

Some Additions to Transmission Systems in the Eleven Western States 1925-1926—Continued.

COMPANY	LOCATION	Length (Miles)	Voltage (Kv.)	No. of Cir- cuits	SUPPORTS	CONDUCTOR	INSULATORS	SPANS		STATUS
								Aver. (ft.)	Max. (ft.)	
San Diego Consolidated Gas & Electric Company.....	San Diego to El Cajon, Calif.	10.25	66	1	Wood Pole	1/0 Copper	5-Locke Suspension	378	1,030	Completed 1925
Southern California Edison Company..	Highlands to San Bernardino, Calif.	6.5	30	1	Wood Pole	4/0 Al.	Pia type	.....	.....	Completed 1925
Southern California Edison Company..	Colton to Riverside, Calif.	6	30	1	Wood Pole	No. 2 Copper	Pin type	.....	.....	Completed 1925
Southern California Edison Company..	San Bernardino to Colton, Calif.	4	30	1	Wood Pole	4/0 Al.	Pia type	.....	.....	Under construction
Southern California Edison Company..	Colton to Colton Cement Works, Calif.	1.75	60	1	Wood Pole	4/0 Al.	10" C.&P. Susp.	.....	.....	Under construction
Southern California Edison Company..	Colton to Colton Cement Works, No. 2, Calif.	1.5	60	1	Wood Pole	4/0 Al.	10" C.&P. Susp.	.....	.....	Under construction
Southern California Edison Company..	Los Angeles No. 3 to Eagle Rock Sub., Calif.	8	60	1	Wood Pole	4/0 Copper and 605,000 c.m. A.C.S.R.	10" C.&P. Susp.	.....	.....	Completed 1925
Southern California Edison Company..	Laurel to Tulare, Calif.	3	60	1	Wood Pole	2/0 Copper	10" C.&P. Susp.	.....	.....	Completed 1925
Southern California Edison Company..	Moorpark to Saugus, Calif.	15	60	1	Steel Tower P.C.S.	4/0 Copper	10" C.&P. Susp.	.....	.....	Completed 1925
Southern California Edison Company..	Torrence to Redondo, Calif.	2	60	1	Wood Pole	4/0 Copper	10" C.&P. Susp.	.....	.....	Completed 1925
Southern California Edison Company..	Venida to Kaweah, Calif.	21	60	1	Wood Pole	2/0 Copper	10" C.&P. Susp.	.....	.....	Completed 1925
Southern California Edison Company..	Saticoy to Castaic, Calif.	11	60	1	Steel Tower P.C.S.	2/0 Copper	10" C.&P. Susp.	.....	.....	Completed 1925
Southern California Edison Company..	Crescenta Sta., Los Angeles to Big Creek 3, Calif.	223.5	220	1	Steel Tower P.C.S. and N.N.S.&D.	1,033,500 c.m. A.C.S.R.	13"-10" Susp. West.	1,420	5,191	To be completed Apr. 1928
Southern Colorado Power Company...	Pueblo to Canyon City, Colo.	39	66	1	Wood Pole W.E.&B.L.C.	No. 1-Str. Copper C.I.W.&M.C.	4- No. 2300 Locke	550	2,100	Completed 1925
Southern Colorado Power Company...	Rocky Ford to La Junta, Colo.	11	66	1	Wood Pole	No. 1 A.C.S.R.	Pin type Thomas	225	350	Completed 1925
The Southern Sierras Power Company	Andrade to border, Calif.	1.7	33	1	Wood Pole J.H.B.	No. 2 Str. Copper	Pin type Pinco	261	461	Completed 1925
The Southern Sierras Power Company	El Centro to Calexico, Calif.	14	33	1	Wood Pole	1/0 Copper	Pin type	264	.....	Proposed 1926
The Southern Sierras Power Company	Forest Home to Mill Creek, Calif.	7.2	88	1	Wood Pole L.B.	2/0 A.C.S.R.	5-Susp. Locke	425	1,425	Completed 1925
Salt River Valley Water Users' Association.....	Horse Mesa Connection, Ariz.	4.5	110	2	Steel Tower P.C.S.	2/0 Copper An.	No. 5800 Locke	800	1,800	Completed 1925
Salt River Valley Water Users' Association.....	Goldfield to Superior, Ariz.	30	110	1	Steel Tower M.I.W.	2/0 Copper An.	No. 5800 Locke	800	1,800	Completed Jan. 1926
Salt River Valley Water Users' Association.....	Roosevelt, Miami, Superior, Mesa, Ariz.	89	110	1	Steel Tower	2/0 Copper	No. 5800 Locke	800	1,800	To be completed 1926
Salt River Valley Water Users' Association.....	Chandler Sub. to Casa Grande Sub.	23	45	3	Wood Pole	2/0 Copper	No. 5800 Locke	300	.....	Completed 1925
Truckee River Power Company.....	Washoe Power House to Virginia City, Nev.	20.9	60	1	Wood Pole	No. 4 Str. Al.	No. 7210 Locke Pin type	200	1,100	Completed 1925
Union Pacific Coal Company.....	Rock Springs to Superior, Wyo.	20	36	2	Wood Pole C.P.C.	No. 4 Copper	Pin type O.B.	175	.....	Completed 1925
Washington Water Power Company...	Long Lake to Stratford, Wash.	87	110	1	Wood Pole V.&C.	7 Str. Copper An.	6-Susp. Locke and Thomas	512	1,285	Completed 1925
Washington Water Power Company...	Fairfield, Wash., to Wallace, Ida.	70	110	1	Wood Pole	7 Str. Copper	.....	.....	.....	Proposed 1926
Washington Water Power Company...	Long Lake to Spokane, Wash.	28	110	1	Wood Pole B.J.C.	3/0 Copper An.	6-Susp. O.B. and Thomas	473	1,590	Completed 1925
Washington Water Power Company...	Spokane to Tekoa, Wash.	38	110	1	Wood Pole C.C.C.	2/0 Copper An.	4-Susp. O.B. and Thomas	450	1,180	Completed 1925
Washington Water Power Company...	Taunton to Neppel, Wash.	24.2	110	1	Wood Pole C.C.C.	7 Str. Copper An.	5-Susp. J.D.I.	400	1,285	Completed 1925

*Operated by Pacific Power & Light Company.

†Abbreviations:—Towers and Poles: P.C.S., Pacific Coast Steel Company; B.J.C., B. J. Carney Company; W.S.C., Weyerhaeuser Sales Company; Mill, Milliken Brothers; N.N.S.&D., Newport News Shipbuilding and Drydock Company; W.E., Western Electric Company; B.L.C., Bell Lumber Company; J.H.B., J. H. Baxter & Company; L.B., Lindsay Brothers Company; M.I.W., Muskegon Iron Works; C.P.C., Chapin Pole Company; V.&C., Valentine & Clark Company; C.C.C., Cook Cedar Company. Conductor:—A.C.S.R., Aluminum Company of America; An., Anaconda Copper Mining Company; C.I.W.&M.C., Chicago Insulating Wire & Manufacturing Company. Insulators:—Locke, Locke Insulator Corporation; West, Westinghouse Electric & Manufacturing Company; O.B., Ohio Brass Company; Pyrex, Corning Glass Company; Pinco, Porcelain Insulator Corporation; Thomas, R. Thomas & Sons Company; J.D.I., Jeffery-Dewitt Insulator Company.

West Leads United States in Power Development

CENTRAL stations of the eleven Western states continue to hold their own with the light and power industry of the nation as a whole. Figures covering the operations of the power companies of this section for 1925 show that the West possesses 14.3 per cent of the total central station customers and 14 per cent of the wired homes of the country. Its power companies generate 19.5 per cent of the total energy generated in the country and 45 per cent of the total energy produced from hydro plants.

Energy generation for the year was 11,594,000,000 kw-hr. as against 10,534,456,000 kw-hr. for 1924, an increase of 10.7 per cent. Of the energy generated 9,749,000,000 kw-hr. was produced by hydro plants and 1,845,000,000 kw-hr. by steam plants. In 1924 but 7,507,327,000 kw-hr. were produced by hydro plants and 3,027,129,000 kw-hr. by steam plants due to the exceedingly dry year on the Pacific Coast. For the same reason there was an appreciable drop in the consumption of oil and natural gas by Western central stations during the year as against 1924. Oil consumption dropped from 7,168,081 bbl. in 1924 to 2,790,000 bbl. in 1925 while the use of natural gas fell from 22,595,903,000 cu. ft. to 10,114,500,000 cu. ft. The West used 27.2 per cent of all fuel oil used in the United States by light and power companies.

The estimated gross revenue for the sale of energy for the year was \$195,000,000 as against \$170,000,000 for 1924, an increase for the year of 14.7 per cent, or more than \$2,000,000 per month. The operating ratio for the industry as a whole for the year is materially below that of 1924, due to more normal operation following the water shortage of 1924. The operating ratio for the past year was 33.8 per cent as against 43.2 per cent for 1924. Operating and maintenance expenses for the past year were \$66,000,000 as against \$73,530,000 for 1924. The operating ratio of central stations of the country as a whole for 1925 was 44.8 per cent.

During the year just passed the number of central station consumers in the eleven Western states increased by 146,249 bringing the total to 2,565,950 as compared to 17,937,160 for the United States. Thus the West has 14.3 per cent of the

nation's total. The number of domestic lighting consumers as of Jan 1, 1926, was 2,030,630, 14 per cent of the total for the country which was 14,532,930. The increase for the year was 102,763. The number of commercial lighting consumers was 389,280, an increase of 28,174 for 1925.

No section of the United States shows a greater development of industrial power load than the eleven Western states. The number of industrial power consumers connected to the lines of Western

Table II—Energy Generated in Public Utility Plants of 11 Western States, 1921-25

State	Energy Generated (Thousands of Kw-hr.)				
	1921*	1922*	1923*	1924*	1925†
California....	3,982,938	4,379,703	5,069,314	5,566,440	6,090,000
Oregon	468,534	512,804	594,434	678,394	737,000
Washington..	1,176,662	1,285,625	1,446,486	1,503,560	1,818,000
Nevada.....	36,532	39,282	47,048	41,623	36,000
Utah.....	119,551	145,689	272,577	266,946	355,000
Arizona.....	132,434	144,615	157,183	153,196	135,000
New Mexico..	15,768	17,140	18,268	19,913	22,000
Colorado.....	362,651	413,475	461,570	490,030	528,000
Wyoming....	37,855	38,985	48,853	53,556	62,000
Idaho	550,149	615,783	694,871	792,532	752,000
Montana	596,610	984,972	1,138,545	1,145,285	1,238,000

*U. S. G. S. data.

†November and December estimated.

central stations as of Jan. 1, 1926, was 148,140 or 23.8 per cent of the total for the country at large. The growth for the year was 15,355 customers. A complete discussion of the industrial load for this section will be found on page 90 of this issue.

California leads the Western states with 1,499,350 consumers or 51.5 per cent of the total. Washington, Colorado, Oregon and Utah follow in order. California is only exceeded in the total number of customers served by New York and Illinois, the former having 2,015,600 consumers and the latter 1,582,550. In the number of commercial lighting consumers California is second only to New York with 247,000 as against 405,000 for the Empire state. California far outdistances all states in the number

Table 1—Central Station Operation, 11 Western States and United States, 1924 and 1925

Item	11 Western States		United States	
	1924	1925	1924	1925
Energy Generated, (thousands of kw-hr.).....	10,534,456	11,594,000	54,413,403	59,517,000
Energy Generated by Hydro Plants (thousands of kw-hr.).....	7,507,327	9,749,000	19,646,801	21,570,000
Energy Generated by Steam Plants (thousands of kw-hr.).....	3,027,129	1,845,000	34,776,602	37,947,000
Fuel Oil Consumption by Central Stations (tons).....	644,932	724,800	32,556,970	35,488,800
Fuel Oil Consumption by Central Stations (bbl.).....	7,168,081	2,790,000	16,096,675	9,869,000
Gas Consumption by Central Stations (thousands cu. ft.).....	22,595,903	10,114,500	46,993,070	47,313,400
Gross Revenue (dollars).....	170,000,000	195,000,000	1,354,570,000	1,470,000,000
Operating and Maintenance Expense.....	73,530,000	66,000,000	617,980,000	659,000,000

Table III—Classification of Central Station Customers in the 11 Western States Showing Growth for 1924, 1925 and 1926

State	Total Domestic Lighting Customers				Total Commercial Lighting Customers				Total Industrial Power Customers				Total Customers—All Classes			
	Jan. 1 1924	Jan. 1 1925	Growth 1925	Jan. 1 1926	Jan. 1 1924	Jan. 1 1925	Growth 1925	Jan. 1 1926	Jan. 1 1924	Jan. 1 1925	Growth 1925	Jan. 1 1926	Jan. 1 1924	Jan. 1 1925	Growth 1925	Jan. 1 1926
California.....	902,680	1,091,892	62,608	1,154,500	227,640	227,640	19,360	247,000	76,686	88,207	9,643	1,176,426	1,407,739	1,407,739	1,499,350	91,611
Oregon.....	126,050	137,943	7,357	145,300	22,063	22,063	1,467	23,530	6,906	7,739	661	153,206	167,745	167,745	177,230	9,485
Washington.....	233,530	248,160	18,340	266,500	41,981	41,981	3,519	45,500	11,886	13,954	3,416	281,580	304,095	304,095	329,370	25,275
Nevada.....	12,180	13,590	40	13,630	2,129	2,129	111	2,240	485	542	38	14,515	16,261	16,261	16,450	189
Utah.....	96,240	104,630	3,170	107,800	10,774	10,774	536	11,310	2,252	2,936	274	108,652	118,339	118,339	122,320	3,980
Arizona.....	25,670	29,090	1,460	30,550	4,775	4,775	415	5,190	1,455	1,776	154	31,583	35,641	35,641	37,670	2,029
New Mexico.....	18,100	19,550	850	20,400	3,334	3,334	216	3,550	817	942	58	22,027	23,826	23,826	24,950	1,124
Colorado.....	133,190	146,670	4,130	150,800	21,900	21,900	1,100	23,000	6,779	8,140	770	159,789	176,710	176,710	182,710	6,000
Wyoming.....	26,010	27,290	110	27,400	3,331	3,331	29	3,360	1,047	1,265	15	30,137	31,886	31,886	32,040	154
Idaho.....	45,040	48,321	2,479	50,800	11,203	11,203	627	11,830	1,788	1,887	113	57,128	61,411	61,411	64,630	3,219
Montana.....	54,820	60,731	2,219	62,950	11,976	11,976	794	12,770	2,805	3,297	213	68,490	76,004	76,004	79,230	3,226
Total 11 West. Sts..	1,673,510	1,927,867	102,763	2,030,630	361,106	361,106	28,174	389,280	112,906	130,685	15,355	2,103,535	2,419,657	2,419,657	2,565,950	146,249
Total U. S.	11,623,644	13,406,777	1,126,153	14,532,930	2,588,983	2,588,983	192,297	2,781,280	502,736	570,844	52,106	14,384,727	16,566,604	16,566,604	17,937,160	1,370,556
% of U. S. Total...	14.4	14.3	14.0	14.0	14.0	14.0	14.0	14.0	22.3	22.8	28.8	14.6	14.6	14.6	14.3	

of industrial power consumers served by central stations with 97,850 against 55,800 for New York and 42,150 for Illinois, its nearest rivals.

California was exceeded by New York and Pennsylvania in the amount of energy generated during the year. The generation for 1925 was: New York 10,050,000,000 kw-hr.; Pennsylvania, 6,430,000,000 kw-hr.; California, 6,090,000,000 kw-hr. Washington, with 1,818,000,000 kw-hr. generated was seventh in the list of states, and second for the West.

Report Shows 280,000,000 Lamps Sold During 1925; Many Improvements

THE sale of incandescent lamps such as are used in the lighting of homes reached the total of 280,000,000 in 1925, according to the annual review of the electrical industry by John Liston of the General Electric Company. This is an increase of 7¼ per cent over 1924, and four and one-half times the figure for 1908. In addition, the sale of miniature lamps, such as are used in automobiles, flashlights, on Christmas trees, and so on, reached the total of 195,000,000, an increase of about 3½ per cent over 1924. The large-lamp business, which in 1908 amounted to nearly 64,000,000 lamps sold, has grown to about four and a half times that volume.

“Although the average wattage of lamps has varied but slightly, the average lumens or candle-power has increased considerably,” Mr. Liston points out. “The price of Mazda lamps has been reduced materially in recent years, due to improved methods in manufacture. The present prices of lamps are on the average less than two-thirds of those in effect in 1914, while the cost of living is now 50 per cent greater than the pre-war figure.”

The most important development of the past year was the development of a practical method of frosting the inside surface of incandescent lamp bulbs. The fragility hazard which formerly existed has been overcome by a chemical treatment. Since the outside of the new bulb is smooth, it does not collect dust as readily as does an outside-frosted lamp and is more easily cleaned. Also, the initial absorption of light due to inside frosting is less than two per cent, while the outside frost absorbs six to eight per cent.

In the miniature lamp field the most important achievement was the production of the double-filament Mazda headlight lamp. It contains two 21-cp. filaments. When one filament is lighted, a powerful beam is projected far down the road. When the other filament is lighted, the beam is tilted down about 2½ deg., so that there is no glare in the eyes of an approaching driver and yet ample light for safe driving.

A further improvement in the automobile-headlight lamp was the introduction of corrugations at the end of the bulb. These are for the purpose of breaking up the image reflected by the bulb, thus eliminating a source of glare.

Table I—Distribution of the Industrial Power Load in the United States

Industry	Total Primary Horse- power	Primary Horsepower				Electric Motors Run by Purchased Energy, Hp.	Electric Motors Run by Energy Generated in Private Plants, Hp.	Boilers	
		Owned by Establishments Reporting						Number	Hp.
		Steam Engines (Not Turbines)	Steam Turbines	Internal- Com- bustion Engines	Water Turbines				
All industries	33,143,753	13,386,996	3,340,204	1,254,140	1,803,317	13,359,096	8,888,569	60,192	16,300,000
Chemicals and allied products	2,738,605	1,060,992	410,660	78,877	168,557	1,019,519	674,556	7,390	2,000,000
Food and kindred products	3,723,130	1,586,547	123,719	182,386	120,912	1,709,566	513,037	9,428	2,000,000
Iron and steel and their products not including machinery	7,243,340	3,629,067	1,047,810	613,724	21,190	1,931,549	3,029,828	9,645	3,000,000
Leather and its finished products	412,961	172,329	41,722	4,256	3,884	190,770	123,029	1,406	500,000
Lumber and allied products	3,336,333	2,336,854	186,575	48,711	42,746	721,447	507,329	11,950	2,000,000
Machinery	2,267,185	442,383	216,403	69,064	26,522	1,512,813	740,352	2,577	1,000,000
Metal and metal products other than iron or steel	1,168,693	299,376	138,178	23,173	11,814	696,152	283,544	969	1,000,000
Musical instruments and phonographs	90,229	35,539	16,997	743	79	36,871	39,078	359	1,000,000
Paper and printing	2,742,693	798,571	194,409	15,186	886,462	848,065	653,081	2,365	1,000,000
Railroad repair shops	806,435	306,195	52,873	23,684	88	423,959	271,731	1,898	1,000,000
Rubber Products	605,634	135,338	121,697	8,859	6,506	333,234	180,799	497	1,000,000
Stone, glass, and clay products	1,919,235	729,529	117,650	92,090	30,582	949,384	424,996	3,066	1,000,000
Textiles and their products	3,800,360	1,379,328	457,772	30,112	466,364	1,466,784	911,262	6,029	1,000,000
Tobacco Manufacturers	43,481	22,587	4,574	417	0	15,903	15,254	254	1,000,000
Transportation equipment, air, land and water	1,667,968	295,405	169,057	50,490	10,940	1,142,076	453,972	969	1,000,000
Miscellaneous industries	577,471	156,956	40,108	12,368	6,671	361,368	66,721	1,390	1,000,000

The Industrial Load of the West

THAT the manufacturing plants in the eleven Western States are 65.0 per cent electrified and that the central stations furnish 79.3 per cent of the energy consumed by them are the two outstanding facts indicated by an industrial survey just completed by the McGraw-Hill Company as a part of a nationwide investigation. Summarized and detailed state data on the use of electrical energy by the various industries in the United States and in the West will be found in the accompanying tabulations. Detailed state data for sections east of the Rockies have appeared in recent issues of Electrical World, and are available upon application to that journal.

The rating in the power machinery installed in the manufacturing establishments of the Mountain and Pacific States on Jan. 1, 1924, was 2,664,687 hp., having increased by 1,091,395 hp. or 70 per

MOUNTAIN and Pacific industries are as a whole the most highly electrified in the country. Although there are 389 private generating plants, central stations supply 79.3 per cent of the total electric energy consumed.

cent, during the ten-year period 1914-1924. Over 70 per cent of this total primary power is concentrated in the three Pacific states. Based upon returns received in the survey, the estimate is made that 283,804 hp. of this total power is installed in private electric generating plants and that 1,447,925 hp. is in electric motors which are run by energy purchased from central station lines. Using these figures as a basis, it is estimated that industry as a whole in the Mountain-Pacific States is now 65.0 per cent electrified. This is the highest degree of industrial electrification reported by any section in the country, other sections reporting as follows: New England 58.2 per cent, Middle Atlantic 59.6 per cent, North Central 64.0 per cent and the Southern States 50.6 per cent.

These eleven Western States report 389 private

Table II—Distribution of the Industrial Power Load in the Pacific States

Industry	Total Primary Horse- power	Primary Horsepower				Electric Motors Run by Purchased Energy, Hp.	Electric Motors Run by Energy Generated in Private Plants, Hp.	Boiler	
		Owned by Establishments Reporting						Number	Hp.
		Steam Engines (Not Turbines)	Steam Turbines	Internal- Com- bustion Engines	Water Turbines				
All industries	1,886,942	647,720	101,393	27,906	50,092	1,059,831	253,036	2,031	1,770,000
Chemicals and allied products	159,240	33,107	7,487	5,612	491	112,543	5,151	138	100,000
Food and kindred products	275,966	60,253	4,084	4,661	3,645	203,323	24,445	184	1,000,000
Iron and steel and their products, not including machinery	79,529	2,552	336	253	0	76,388	0	4	1,000,000
Leather and its finished products	6,984	1,584	72	6	0	5,322	808	15	1,000,000
Lumber and allied products	794,867	505,565	80,350	12,861	10,780	185,311	197,734	1,474	800,000
Machinery	80,867	1,200	1,530	1,025	41	77,071	106	41	1,000,000
Metal and metal products other than iron and steel	20,302	1,017	298	44	1	18,942	13	2	1,000,000
Musical instruments and phonographs	834	0	0	0	0	834	0	0	1,000,000
Paper and printing	151,304	27,481	6,050	199	30,635	86,939	18,134	95	80,000
Railroad repair shops	47,978	7,348	0	349	0	40,281	376	8	30,000
Rubber products	17,819	115	195	0	0	17,509	0	1	1,000,000
Stone, clay, and glass products	105,746	4,156	63	1,419	2,905	97,203	4,671	43	50,000
Textiles and their products	21,474	540	458	43	1,586	18,847	375	7	1,000,000
Tobacco manufacturers	508	0	0	0	0	508	0	0	1,000,000
Transportation equipment, air, land and water	77,748	984	74	199	5	76,486	479	4	70,000
Miscellaneous industries	45,776	1,818	396	1,235	3	42,324	744	15	2,000,000

f January 1, 1924 and Energy Consumed by Industrial Plants During 1924

Estimated Rating of Prime Movers Used in Private Generating Plants, Hp.	Estimated Electrification of Industry Per Cent	Energy Consumed			Generators in Private Plants			A.C. Motors		D.C. Motors		Motors Under 5 Hp.	
		Total Energy Consumed, Kw.-Hr.	Purchased from Central Stations Kw.-Hr.	Generated in Private Plants, Kw.-Hr.	Total Rating of Generators, Kva.	Rating of A. C. Generators, Kva.	Rating of D. C. Generators, Kw.	Number	Hp.	Number	Hp.	Number	Hp.
6,416,763	59.7	(Thousands) 31,004,483	(Thousands) 19,373,722	(Thousands) 11,630,761	5,913,462	4,411,577	1,501,885	1,176,439	15,389,566	668,298	6,858,099	989,010	2,266,441
630,803	60.3	4,442,617	3,379,952	1,062,665	584,344	397,896	186,448	78,898	1,251,499	77,042	442,576	87,474	240,866
543,158	60.2	3,517,092	2,670,520	846,572	494,514	297,635	196,879	94,070	1,347,866	106,059	874,737	109,283	282,764
1,973,344	54.0	6,103,792	2,393,789	3,710,003	1,830,094	1,497,778	332,316	62,394	2,200,614	122,056	2,760,763	49,340	138,686
68,462	62.8	404,164	243,560	160,604	63,306	36,775	26,531	21,343	221,450	11,551	92,349	16,533	46,446
317,643	31.2	1,357,710	777,511	580,199	293,704	243,284	50,420	81,076	1,110,787	12,536	117,989	50,207	139,478
326,802	80.9	1,694,777	1,190,894	503,883	302,439	184,923	117,516	150,507	1,590,097	88,864	663,068	158,896	355,560
251,173	81.1	1,506,129	1,095,928	410,201	232,436	117,302	115,134	60,000	627,944	36,325	351,752	47,886	116,844
29,361	73.4	57,140	27,940	29,200	27,173	19,306	7,867	4,992	57,768	2,245	18,181	3,824	8,528
719,154	57.2	3,986,139	2,262,323	1,723,816	645,262	562,441	82,821	41,270	1,245,510	29,643	255,636	31,576	76,385
156,056	71.8	592,390	360,079	232,311	144,516	99,525	44,991	22,904	403,179	20,051	292,167	15,433	50,285
153,360	80.3	872,074	558,259	313,815	142,091	124,265	17,826	68,747	440,362	5,785	73,571	49,834	119,910
188,634	59.3	1,638,143	1,139,421	498,722	173,542	122,782	50,760	44,776	1,183,082	25,689	191,298	32,878	123,882
662,882	56.1	2,171,102	1,322,071	849,031	606,584	542,402	64,182	282,705	2,162,697	51,507	215,349	229,125	339,247
13,058	66.7	39,753	24,829	14,924	12,101	5,175	6,926	8,560	17,971	3,034	13,186	8,343	10,384
309,159	87.2	2,050,946	1,451,914	599,032	286,379	143,137	143,242	130,377	1,334,272	26,684	261,776	43,806	111,566
80,714	76.6	570,515	474,732	95,783	74,977	16,951	58,026	23,820	194,368	49,227	233,721	54,572	105,610

industrial electric generating plants, by far the lowest number reported by any section of the country. These private plants have a total generator rating of 262,942 kva. which exceeds by 48,000 kva. the combined rating of the central station plants in Idaho, Wyoming, New Mexico, Arizona and Nevada. During 1924 these private plants generated a total of 535,940,000 kw.-hr. In addition to this consumption of privately generated energy, the industrial plants of this section purchased 2,042,912,000 kw.-hr. from central station companies, making a total energy consumption during 1924 of 2,578,852,000 kw.-hr. of which 79.2 per cent was purchased from central station lines and 20.8 per cent was generated in private plants. This is the lowest percentage of privately generated energy reported by any section of the country, other sections reporting privately generated energy as follows: New England 41.6 per cent, Middle Atlantic 37.3 per cent, North Central 42.2 per cent and the Southern States 33.5 per cent.

There are 125,998 electric motors, with a combined rating of 1,826,123 hp., installed in the industrial plants of the Western States. Of the total number of motors 69.7 per cent are alternating current and 30.3 per cent are direct current machines. Approximately 49 per cent of the total number of motors are under 5 hp.

A total of eighteen different distribution voltages was reported and one company reported the transmission of energy at 33,000 volts. Five different frequencies were reported. These figures would indicate that there is still a large field open for the standardization of electrical equipment in the Western States.

A study of the industries operating in the Western States brings out the diversity in the central station industrial load. There are three industrial groups in the section as a whole with an aggregate primary power totaling 1,672,000 hp. or 63 per cent of the total installed industrial power of the section, these industries in their order of importance being the lumber and allied products, food and kindred products and metal and metal products other than iron and steel. The food industry is common to both the Mountain and Pacific States, but the metals industry is confined very largely to the Mountain States, and the lumber industry is confined very largely to the Pacific States. There are two industries, the metals and the lumber industries which consume over five hundred million kilowatt hours annually. In one of these, the lumber industry, the private plant is the predominating factor.

The lumber industry has a total installed power of 874,664 hp. or approximately one-third of the

January 1, 1924 and Energy Consumed by Industrial Plants During 1924

Estimated Rating of Prime Movers Used in Private Generating Plants, Hp.	Estimated Electrification of Industry Per Cent	Energy Consumed			Generators in Private Plants			A.C. Motors		D.C. Motors		Motors Under 5 Hp.	
		Total Energy Consumed, Kw.-Hr.	Purchased from Central Stations Kw.-Hr.	Generated in Private Plants, Kw.-Hr.	Total Rating of Generators, Kva.	Rating of A. C. Generators, Kva.	Rating of D. C. Generators, Kw.	Number	Hp.	Number	Hp.	Number	Hp.
163,418	65.0	(Thousands) 1,765,838	(Thousands) 1,422,362	(Thousands) 343,476	151,473	136,282	15,191	71,440	1,042,716	29,444	270,151	48,568	151,691
5,295	74.0	237,367	226,970	10,397	4,907	4,907	0	6,940	78,549	7,910	39,145	7,200	34,137
23,276	82.2	208,732	186,350	22,382	21,568	17,888	3,680	12,540	186,808	4,390	40,960	11,945	31,805
0	96.0	85,095	85,095	0	0	0	0	961	33,938	1,867	42,450	544	1,835
927	89.5	7,652	6,642	1,010	860	0	860	115	1,554	744	4,576	315	946
115,050	37.8	489,300	236,700	252,600	106,650	100,000	6,650	13,910	370,025	527	13,020	4,590	16,215
75	95.5	65,330	65,240	90	70	0	70	3,260	23,947	7,610	53,230	5,112	10,840
15	93.3	35,997	35,972	25	14	0	0	384	13,761	165	5,194	294	482
0	100.0	677	677	0	0	0	0	48	774	16	60	22	33
14,445	67.0	288,520	238,600	49,920	13,390	11,389	2,001	2,517	58,675	3,255	46,398	1,953	4,870
324	84.7	37,547	37,190	357	300	287	13	1,081	29,812	815	10,845	1,077	2,593
0	98.4	35,227	35,227	0	0	0	0	973	16,934	111	575	473	1,631
1,940	93.8	90,854	86,685	4,169	1,795	22	1,773	11,330	94,029	1,249	7,845	6,224	20,045
400	89.7	41,500	40,690	810	372	298	74	4,214	19,099	19	123	2,821	10,158
0	100.0	856	856	0	0	0	0	67	388	25	12	51	121
167	98.5	65,098	64,693	405	155	0	65	8,491	72,865	146	4,100	4,414	12,626
1,504	95.7	76,086	74,775	1,311	1,392	1,392	0	4,609	41,558	597	1,510	1,533	3,354

total installed power of the entire section. According to the reports received in this survey and the available government data, these mills are 36.2 per cent electrified. This is a high degree of electrification when it is remembered that these mills are located in isolated places for the most part. During 1924 these mills consumed a total of 517,881,000 kw-hr. of electrical energy, of which 47.9 per cent

was purchased from central station companies and 52.2 per cent was generated in private plants. The rating of the generators in these plants totals 113,950 kva. or sufficient capacity to supply a modern city of 370,000 population with light, heat, power and transportation.

The food industry, the manufacturing industry second in importance in the Western States, is

Table III—Distribution of the Industrial Power Load in the Mountain States

Industry	Total Primary Horse- power	Primary Horsepower				Electric Motors Run by Purchased Energy, Hp.	Electric Motors Run by Energy Generated in Private Plants, Hp.	Boiler
		Owned by Establishments Reporting						Number
		Steam Engines (Not Turbines)	Steam Turbines	Internal- Com- bustion Engines	Water Turbines			
All industries.....	777,745	278,041	79,206	23,192	9,212	388,094	125,162	753
Chemicals and allied products.....	36,647	12,459	4,460	1,525	500	17,703	9,817	61
Food and kindred products.....	143,836	77,450	4,265	4,662	3,271	54,188	20,476	235
Iron and steel and their products, not including machinery....	48,672	42,027	2,828	0	0	3,817	10,728	58
Leather and its finished products.....	1,306	575	350	0	0	381	34	9
Lumber and allied products.....	79,797	57,733	11,367	1,848	135	8,714	13,654	161
Machinery.....	11,265	130	20	47	0	11,068	224	2
Metal and metal products other than iron and steel.....	359,294	62,920	53,617	13,050	4,574	225,133	60,332	107
Musical instruments and phonographs.....	0	0	0	0	0	0	0	0
Paper and printing.....	10,112	670	33	124	33	9,252	212	2
Railroad repair shops.....	43,008	14,194	1,308	358	75	27,153	9,602	19
Rubber products.....	2,455	0	0	0	0	2,455	0	0
Stone, glass, and clay products.....	36,411	8,839	598	1,556	484	24,934	55	88
Textiles and their products.....	2,211	655	350	0	50	1,156	18	7
Tobacco manufacturers.....	9	0	0	0	0	9	0	0
Transportation equipment, air, land and water.....	900	50	0	10	0	840	0	1
Miscellaneous industries.....	1,742	339	10	12	90	1,291	10	3

Table IV—Distribution of the Industrial Power Load in the Mountain Pacific States

Industry	Total Primary Horse- power	Primary Horsepower				Electric Motors Run by Purchased Energy, Hp.	Electric Motors Run by Energy Generated in Private Plants, Hp.	Boil- Number
		Owned by Establishments Reporting						
		Steam Engines (Not Turbines)	Steam Turbines	Internal- Comb- ustion Engines	Water Turbines			
All industries.....	2,664,687	925,761	180,599	51,098	59,304	1,447,925	378,198	2,784
Chemicals and allied products.....	195,887	45,566	11,497	7,137	991	130,246	14,968	199
Food and kindred products.....	419,802	137,703	8,349	9,323	6,916	257,511	44,921	419
Iron and steel and their products, not including machinery...	128,201	44,579	3,164	253	0	80,205	10,728	62
Leather and its finished products.....	8,290	2,159	422	6	0	5,703	842	24
Lumber and its allied products.....	874,664	563,298	91,717	14,709	10,915	194,025	211,388	1,635
Machinery.....	92,132	1,330	1,550	1,072	41	88,139	330	43
Metal and metal products other than iron and steel.....	379,596	63,937	53,915	13,094	4,575	244,075	60,345	109
Musical instruments and phonographs.....	834	0	0	0	0	834	0	0
Paper and printing.....	161,416	28,151	6,083	323	30,668	96,191	18,346	97
Railroad repair shops.....	91,066	21,542	1,308	707	75	67,434	9,978	27
Rubber products.....	20,274	115	195	0	0	19,964	0	1
Stone, Clay and glass products.....	142,157	12,995	661	2,975	3,389	122,137	4,726	131
Textiles and their products.....	23,685	1,195	808	43	1,636	20,003	393	14
Tobacco manufacturers.....	517	0	0	0	0	517	0	0
Transportation equipment, air, land and water.....	78,648	1,034	74	209	5	77,326	479	5
Miscellaneous industries.....	47,518	2,154	406	1,247	93	43,615	754	18

Table V—Distribution of the Industrial Power Load in California

Industry	Total Primary Horse- power	Primary Horsepower				Electric Motors Run by Purchased Energy, Hp.	Electric Motors Run by Energy Generated in Private Plants, Hp.	Boiler Number
		Owned by Establishments Reporting						
		Steam Engines (Not Turbines)	Steam Turbines	Internal- Com- bustion Engines	Water Turbines			
All industries	971,315	186,469	33,459	15,751	10,724	724,912	88,103	622
Chemicals and allied products	136,904	27,118	5,460	5,277	208	98,841	4,514	110
Food and kindred products	198,030	48,431	3,760	3,279	158	142,402	23,645	149
Iron and steel and their products, not including machinery	62,459	2,161	297	253	0	59,748	0	3
Leather and its finished products	5,795	1,377	68	6	0	4,344	780	13
Lumber and its allied products	207,469	93,743	16,900	2,856	7,259	86,711	52,080	254
Machinery	60,851	870	1,405	951	41	57,584	106	34
Metal and metal products other than iron and steel	10,008	200	265	10	1	9,532	0	1
Musical instruments and phonographs	511	0	0	0	0	511	0	0
Paper and printing	40,816	4,544	4,160	178	3,046	28,888	5,240	25
Railroad repair shops	31,610	5,331	0	349	0	25,930	260	5
Rubber products	16,015	115	195	0	0	15,705	0	1
Stone, clay, and glass products	84,853	1,196	53	1,297	5	82,302	334	13
Textiles and their products	15,652	260	458	10	6	14,918	0	5
Tobacco manufacturers	502	0	0	0	0	502	0	0
Transportation equipment, air, land and water	58,392	273	72	105	0	57,942	412	1
Miscellaneous industries	41,448	850	366	1,180	0	39,052	732	8

71.5 per cent electrified. These factories consumed a total of 276,997,000 kw-hr. of electrical energy during 1924 of which 85 per cent was purchased from central station companies. Only 41,125,000 kw-hr. were generated by private generating plants, although there are 118 private generating plants in the section. Over 70 per cent of the electric motors installed in these food factories are under 5 hp.

The metals industry is the third largest industry of the section so far as installed power is concerned, but almost 95 per cent of this power is located in the Mountain States. The reports received in the survey indicate that this industry consumed more electrical energy than any other industry operating in the section with a total of 577,568,000 kw-hr. The metals industry consumed an average of 1,900

January 1, 1924 and Energy Consumed by Industrial Plants During 1924

Estimated Rating of Prime Movers Used in Private Generating Plants, Hp.	Estimated Electrification of Industry Per Cent	Energy Consumed			Generators in Private Plants			A.C. Motors		D.C. Motors		Motors Under 5 Hp.	
		Total Energy Consumed, Kw.-Hr.	Purchased from Central Stations Kw.-Hr.	Generated in Private Plants, Kw.-Hr.	Total Rating of Generators, Kva.	Rating of A. C. Generators, Kva.	Rating of D. C. Generators, Kw.	Number	Hp.	Number	Hp.	Number	Hp.
120,386	65.5	(Thousands) 813,014	(Thousands) 620,550	(Thousands) 192,464	111,469	80,586	30,883	16,340	382,226	8,774	131,030	12,929	37,453
10,133	76.0	55,692	35,858	19,834	9,386	9,370	16	1,632	18,411	1,841	9,109	1,683	7,963
19,524	51.3	68,265	49,522	18,743	18,090	15,007	3,083	4,107	61,218	1,438	13,446	3,914	10,414
7,400	23.1	16,266	4,256	11,970	6,850	4,025	2,825	185	6,457	357	8,088	106	353
39	32.2	519	477	42	36	0	0	36	106	52	309	29	85
7,889	20.8	28,581	11,133	17,448	7,300	6,838	462	813	21,606	34	762	332	1,174
157	99.5	9,540	9,350	190	145	0	145	485	3,544	1,131	7,748	761	1,615
66,920	80.3	541,571	426,886	114,685	61,995	38,055	23,940	6,205	222,727	1,995	62,738	4,336	10,531
0	0	0	0	0	0	0	0	0	0	0	0	0	0
168	93.0	25,930	25,350	580	156	133	23	255	8,583	168	881	186	398
8,092	81.8	33,920	25,054	8,866	7,452	7,125	327	806	10,142	1,541	26,613	658	1,861
0	100.0	4,935	4,935	0	0	0	0	69	2,168	32	287	72	167
24	68.6	22,278	22,229	49	22	0	22	1,418	24,239	155	750	675	2,367
19	53.2	2,533	2,494	39	18	14	4	143	1,074	18	10	74	236
0	100.0	16	16	0	0	0	0	4	9	0	0	4	9
0	93.4	711	711	0	0	0	0	29	641	12	199	12	39
21	75.3	2,297	2,279	18	19	19	0	176	1,301	0	0	87	244

January 1, 1924 and Energy Consumed by Industrial Plants During 1924

Estimated Rating of Prime Movers Used in Private Generating Plants, Hp.	Estimated Electrification of Industry Per Cent	Energy Consumed			Generators in Private Plants			A.C. Motors		D.C. Motors		Motors Under 5 Hp.	
		Total Energy Consumed, Kw.-Hr.	Purchased from Central Stations Kw.-Hr.	Generated in Private Plants, Kw.-Hr.	Total Rating of Generators, Kva.	Rating of A. C. Generators, Kva.	Rating of D. C. Generators, Kw.	Number	Hp.	Number	Hp.	Number	Hp.
283,804	65.0	(Thousands) 2,578,852	(Thousands) 2,042,912	(Thousands) 535,940	262,942	216,868	46,074	87,780	1,424,942	38,218	401,181	61,497	189,144
15,428	74.3	293,059	262,828	30,231	14,293	14,277	16	8,572	96,960	9,751	48,254	8,883	42,100
42,800	71.5	276,997	235,872	41,125	39,658	32,895	6,763	16,647	248,026	5,828	54,406	15,859	42,219
7,400	68.4	101,321	89,351	11,970	6,850	4,025	2,825	1,146	40,395	2,224	50,538	650	2,188
966	80.4	8,171	7,119	1,052	896	0	896	128	1,660	796	4,885	344	1,031
122,939	36.2	517,881	247,833	270,048	113,950	106,838	7,112	14,723	391,631	561	13,782	4,922	17,389
232	95.8	74,870	74,590	280	215	0	215	3,745	27,491	8,741	60,978	5,873	12,455
66,935	82.1	577,568	462,858	114,710	62,009	38,064	23,945	6,589	236,488	2,160	67,932	4,630	11,013
0	100.0	677	677	0	0	0	0	48	774	14	60	22	33
14,613	68.6	314,450	263,950	50,500	13,546	11,522	2,024	2,772	67,258	3,423	47,279	2,139	5,268
8,416	83.3	71,467	62,244	9,223	7,752	7,412	340	1,887	39,954	2,356	37,458	1,735	4,454
0	98.6	40,162	40,162	0	0	0	0	1,042	19,102	143	862	545	1,798
1,964	87.3	113,132	108,914	4,218	1,817	22	1,795	12,748	118,268	1,404	8,595	6,899	22,409
419	86.3	44,033	43,184	849	390	312	78	4,357	20,173	37	223	2,895	10,394
0	100.0	872	872	0	0	0	0	71	397	25	120	55	130
167	98.4	65,809	65,404	405	155	90	65	8,520	73,506	158	4,299	4,426	12,615
1,525	95.0	78,383	77,054	1,329	1,411	1,411	0	4,785	42,859	597	1,510	1,620	3,598

January 1, 1924 and Energy Consumed by the Industrial Plants During 1924

Estimated Rating of Prime Movers Used in Private Generating Plants, Hp.	Estimated Electrification of Industry Per Cent	Energy Consumed			Generators in Private Plants			A.C. Motors		D.C. Motors		Motors Under 5 Hp.	
		Total Energy Consumed, Kw.-Hr.	Purchased from Central Stations Kw.-Hr.	Generated in Private Plants, Kw.-Hr.	Total Rating of Generators, Kva.	Rating of A. C. Generators, Kva.	Rating of D. C. Generators, Kw.	Number	Hp.	Number	Hp.	Number	Hp.
64,289	81.3	(Thousands) 1,053,952	(Thousands) 939,031	(Thousands) 114,921	59,583	52,607	6,976	51,553	627,728	21,765	185,287	36,525	116,128
4,640	75.5	208,410	199,300	9,110	4,300	4,300	0	6,100	68,955	6,950	34,400	6,325	30,000
22,500	83.2	152,150	130,500	21,650	20,850	17,290	3,560	9,140	136,197	3,200	29,850	8,710	23,200
0	95.7	66,550	66,550	0	0	0	0	752	26,548	1,460	33,200	425	1,435
895	90.5	66,395	5,420	975	830	0	830	96	1,300	622	3,824	263	790
30,050	56.2	177,350	110,800	66,550	27,850	26,100	1,750	5,040	134,080	190	4,711	1,660	5,875
75	94.8	48,840	48,750	90	70	0	70	2,435	17,890	5,690	39,800	3,820	8,100
0	95.2	18,100	18,100	0	0	0	0	193	6,922	83	2,610	148	125
0	100.0	415	415	0	0	0	0	14	463	9	48	11	23
4,150	80.8	93,570	79,200	14,370	3,850	3,275	575	747	9,410	1,430	24,718	608	1,720
278	82.7	24,190	23,950	240	202	193	9	736	23,130	338	3,060	767	1,775
0	98.1	31,600	31,600	0	0	0	0	890	15,235	96	470	423	1,480
138	97.0	73,698	73,400	298	128	2	126	9,960	75,610	1,100	7,026	5,530	17,700
0	95.3	32,200	32,200	0	0	0	0	3,390	14,918	0	0	2,285	9,150
0	100.0	846	846	0	0	0	0	65	382	25	120	50	120
143	99.5	49,348	49,000	348	133	77	56	7,780	58,354	0	0	4,140	11,650
1,480	97.7	70,290	69,000	1,290	1,370	1,370	0	4,215	38,334	572	1,450	1,360	2,985

kw-hr. per horsepower of motors installed, a very high use of energy when compared with 1,280 kw-hr. and 920 kw-hr. per motor horsepower in the lumber and food industries respectively. Private generating plants supplied 114,710,000 kw-hr. or 19.8 per cent of the total amount of energy consumed by the metals industry. The fact that the steam turbine installation in the private power

plants totals 53,915 hp. would indicate that the private plants in the metal mills of these states embody engineering equipment of a high and efficient type.

Of the eleven states comprising the Mountain-Pacific section, California, the state with the largest power installation, reported the second highest degree of electrification, 81.3 per cent, being out-

Table VI—Distribution of the Industrial Power Load in Washington

Industry	Total Primary Horse- power	Primary Horsepower				Electric Motors Run by Purchased Energy, Hp.	Electric Motors Run by Energy Generated in Private Plants, Hp.	Boile Number
		Owned by Establishments Reporting						
		Steam Engines (Not Turbines)	Steam Turbines	Internal- Com- bustion Engines	Water Turbines			
All industries.....	593,330	318,000	41,420	10,498	6,211	217,201	103,211	997
Chemicals and allied products.....	16,920	4,465	677	335	268	11,175	489	18
Food and kindred products.....	44,849	7,107	210	799	899	35,834	439	21
Iron and steel and their products, not including machinery.....	15,010	391	39	0	0	14,580	0	1
Leather and its finished products.....	484	86	4	0	0	394	28	1
Lumber and its allied products.....	379,324	284,631	38,400	9,053	337	46,903	95,298	870
Machinery.....	13,786	295	125	71	0	13,295	0	6
Metal and metal products other than iron and steel.....	9,601	817	33	0	0	8,751	0	1
Musical instruments and phonographs.....	323	0	0	0	0	323	0	0
Paper and printing.....	63,993	15,805	1,890	11	1,802	44,485	2,612	50
Railroad repair shops.....	11,326	1,387	0	0	0	9,939	116	2
Rubber products.....	650	0	0	0	0	650	0	0
Stone, clay, and glass products.....	15,831	2,151	10	95	2,900	10,675	4,162	22
Textiles and their products.....	1,448	0	0	5	0	1,443	0	0
Tobacco manufacturers.....	1	0	0	0	0	1	0	0
Transportation equipment, air, land and water.....	17,683	435	2	82	5	17,159	67	2
Miscellaneous industries.....	2,101	430	30	47	0	1,594	0	3

Table VII—Distribution of the Industrial Power Load in Oregon

Industry	Total Primary Horse- power	Primary Horsepower				Electric Motors Run by Purchased Energy, Hp.	Electric Motors Run by Energy Generated in Private Plants, Hp.	Boil- Number
		Owned by Establishments Reporting						
		Steam Engines (Not Turbines)	Steam Turbines	Internal- Com- bustion Engines	Water Turbines			
All industries	322,297	143,251	26,514	1,657	33,157	117,718	61,722	412
Chemicals and allied products	5,416	1,524	1,350	0	15	2,527	148	10
Food and kindred products	33,087	4,715	114	583	2,588	25,087	361	14
Iron and steel and their products, not including machinery	2,060	0	0	0	0	2,060	0	0
Leather and its finished products	705	121	0	0	0	584	0	1
Lumber and its allied products	208,074	127,191	25,050	952	3,184	51,697	50,356	350
Machinery	6,230	35	0	3	0	6,192	0	1
Metal and metal products other than iron and steel	693	0	0	34	0	659	13	0
Musical instruments and phonographs	0	0	0	0	0	0	0	0
Paper and printing	46,495	7,132	0	10	25,787	13,566	10,282	20
Railroad repair shops	5,042	630	0	0	0	4,412	0	1
Rubber products	1,154	0	0	0	0	1,154	0	0
Stone, clay, and glass products	5,062	809	0	27	0	4,226	175	8
Textiles and their products	4,374	280	0	28	1,580	2,486	375	2
Tobacco manufacturers	5	0	0	0	0	5	0	0
Transportation equipment, air, land and water	1,673	276	0	12	0	1,385	0	1
Miscellaneous industries	2,227	538	0	8	3	1,678	12	4

Table VIII—Distribution of the Industrial Power Load in Montana

Industry	Total Primary Horse- power	Primary Horsepower				Electric Motors Run by Purchased Energy, Hp.	Electric Motors Run by Energy Generated in Private Plants, Hp.	Boiler Number
		Owned by Establishments Reporting						
		Steam Engines (Not Turbines)	Steam Turbines	Internal- Com- bustion Engines	Water Turbines			
All industries	190,516	27,852	2,248	1,466	4,511	154,439	6,774	60
Chemicals and allied products	3,498	433	52	0	0	3,013	17	2
Food and kindred products	13,571	3,894	206	902	453	8,116	1,069	12
Iron and steel and their products, not including machinery	26	0	0	0	0	26	0	0
Leather and its finished products	7	0	0	0	0	7	0	0
Lumber and its allied products	15,631	12,940	960	515	0	1,216	2,579	32
Machinery	518	0	0	0	0	518	0	0
Metal and metal products other than iron and steel	140,525	7,900	1,000	0	3,974	127,651	1,550	8
Musical instruments and phonographs	0	0	0	0	0	0	0	0
Paper and printing	1,803	0	0	48	0	1,746	1	0
Railroad repair shops	7,925	2,415	0	0	75	5,435	1,528	3
Rubber products	0	0	0	0	0	0	0	0
Stone, clay, and glass products	6,839	270	30	1	0	6,538	30	3
Textiles and their products	12	0	0	0	0	12	0	0
Tobacco manufacturers	5	0	0	0	0	5	0	0
Transportation equipment, air, land and water	25	0	0	0	0	25	0	0
Miscellaneous industries	131	0	0	0	0	131	0	0

distanced only by Montana which reports industrial electrification of 83.9 per cent. The high figure reported for Montana is due mainly to the high electrification, 92.1 per cent, of the metals industry, the leading industry of the state. California has a power installation of 971,315 hp. of which only 64,289 hp. is in private electric generating plants. The manufacturing plants of California consumed

a total of 1,053,952,000 kw-hr. of electrical energy during 1924, of which 81.8 per cent was purchased from central station companies. It must be remembered in this connection that this consumption of energy does not include the energy consumed by the mining industry, or the consumption for irrigation purposes. While the 89 private plants of the state generated 114,921,000 kw-hr. during

January 1, 1924 and Energy Consumed by the Industrial Plants During 1924

Estimated Rating of Prime Movers Used in Private Generating Plants, Hp.	Estimated Electrification of Industry Per Cent	Energy Consumed			Generators in Private Plants			A.C. Motors		D.C. Motors		Motors Under 5 Hp.	
		Total Energy Consumed, Kw.-Hr.	Purchased from Central Stations Kw.-Hr.	Generated in Private Plants, Kw.-Hr.	Total Rating of Generators, Kva.	Rating of A. C. Generators, Kva.	Rating of D. C. Generators, Kw.	Number	Hp.	Number	Hp.	Number	Hp.
		(Thousands)	(Thousands)	(Thousands)									
60,892	46.9	456,852	322,638	134,214	56,425	51,250	5,175	12,058	268,810	4,984	51,602	7,380	22,324
505	69.0	23,558	22,570	988	467	467	0	690	7,804	780	3,860	715	3,380
420	80.8	33,252	32,850	402	388	322	66	2,000	29,743	700	6,530	1,900	5,060
32	97.1	16,250	16,250	0	0	0	0	183	6,480	357	8,100	104	350
56,000	88.0	527	492	35	30	0	30	8	106	51	316	22	66
0	27.1	181,650	59,900	121,750	51,900	48,700	3,200	5,160	137,365	196	4,836	1,705	6,020
0	96.2	11,250	11,250	0	0	0	0	563	4,135	1,310	9,160	882	1,870
0	91.2	16,620	16,620	0	0	0	0	177	6,351	76	2,400	135	330
0	100.0	262	262	0	0	0	0	34	311	5	12	11	10
2,075	72.9	129,150	122,000	7,150	1,920	1,634	286	1,250	42,717	825	4,380	920	1,950
106	88.6	9,277	9,160	117	98	94	4	221	2,785	420	7,270	180	518
0	100.0	1,307	1,307	0	0	0	0	18	530	8	70	19	43
1,730	78.3	13,235	9,520	3,715	1,600	20	1,580	840	14,392	91	445	400	1,400
0	99.6	3,120	3,120	0	0	0	0	174	1,320	19	123	97	310
0	100.0	2	2	0	0	0	0	1	1	0	0	1	1
24	97.0	14,577	14,520	57	22	13	9	525	13,126	146	4,100	174	696
0	75.8	2,815	2,815	0	0	0	0	214	1,594	0	0	115	320

January 1, 1924 and Energy Consumed by the Industrial Plants During 1924

Estimated Rating of Prime Movers Used in Private Generating Plants, Hp.	Estimated Electrification of Industry Per Cent	Energy Consumed			Generators in Private Plants			A.C. Motors		D.C. Motors		Motors Under 5 Hp	
		Total Energy Consumed, Kw.-Hr.	Purchased from Central Stations Kw.-Hr.	Generated in Private Plants, Kw.-Hr.	Total Rating of Generators, Kva.	Rating of A. C. Generators, Kva.	Rating of D. C. Generators, Kw.	Number	Hp.	Number	Hp.	Number	Hp.
		(Thousands)	(Thousands)	(Thousands)									
38,237	48.4	255,034	160,693	94,341	35,465	32,425	3,040	7,829	146,178	2,695	33,262	4,663	13,239
150	49.5	5,399	5,100	299	140	140	0	150	1,790	180	885	160	757
356	76.8	23,330	23,000	330	330	276	54	1,400	20,868	490	4,580	1,335	3,545
0	100.0	2,295	2,295	0	0	0	0	26	910	50	1,150	15	50
0	82.8	730	730	0	0	0	0	11	148	71	436	30	90
29,000	38.8	130,300	66,000	64,300	26,900	25,200	1,700	3,710	98,580	141	3,473	1,225	4,320
0	99.5	5,240	5,240	0	0	0	0	262	1,922	610	4,270	410	870
15	97.4	1,277	1,252	25	14	9	5	14	488	6	184	11	27
0	100.0	0	0	0	0	0	0	0	0	0	0	0	0
8,220	46.8	65,800	37,400	28,400	7,620	6,480	1,140	520	6,548	1,000	17,300	425	1,200
0	87.6	4,080	4,080	0	0	0	0	124	3,897	57	515	130	300
0	100.0	2,320	2,320	0	0	0	0	65	1,119	7	35	31	108
72	84.9	3,921	3,765	156	67	0	67	530	4,027	58	374	294	945
400	66.0	6,180	5,370	810	372	298	74	650	2,861	0	0	439	698
0	100.0	8	8	0	0	0	0	1	5	0	0	0	0
0	82.7	1,173	1,173	0	0	0	0	186	1,385	0	0	100	280
24	26.4	2,981	2,960	21	22	22	0	180	1,630	25	60	58	49

January 1, 1924 and Energy Consumed by the Industrial Plants During 1924

Estimated Rating of Prime Movers Used in Private Generating Plants, Hp.	Estimated Electrification of Industry Per Cent	Energy Consumed			Generators in Private Plants			A.C. Motors		D.C. Motors		Motors Under 5 Hp.	
		Total Energy Consumed, Kw.-Hr.	Purchased from Central Stations Kw.-Hr.	Generated in Private Plants, Kw.-Hr.	Total Rating of Generators, Kva.	Rating of A. C. Generators, Kva.	Rating of D. C. Generators, Kw.	Number	Hp.	Number	Hp.	Number	Hp.
		(Thousands)	(Thousands)	(Thousands)									
5,541	83.9	282,658	273,960	8,698	5,134	4,205	929	4,061	117,281	1,938	43,932	3,103	8,345
17	86.7	6,124	6,090	34	16	16	0	180	2,030	202	1,000	185	875
1,020	67.3	8,415	7,435	980	945	785	160	505	7,535	177	1,650	481	1,280
0	100.0	29	29	0	0	0	0	1	12	1	14	0	0
0	100.0	9	9	0	0	0	0	1	2	1	5	1	2
1,490	17.3	4,848	1,553	3,295	1,380	1,290	90	138	3,665	6	130	46	162
0	100.0	438	438	0	0	0	0	26	192	61	326	41	87
1,720	92.1	245,450	242,500	2,950	1,595	980	615	2,615	93,801	1,125	35,400	2,000	4,860
0	100.0	0	0	0	0	0	0	0	0	0	0	0	0
1	96.9	4,787	4,785	2	1	1	0	47	1,584	31	163	34	73
1,280	84.7	6,420	5,010	1,410	1,185	1,133	52	153	1,923	292	5,040	125	352
0	100.0	0	0	0	0	0	0	0	0	0	0	0	0
13	95.8	5,852	5,825	27	12	0	12	372	6,371	40	197	177	620
0	100.0	25	25	0	0	0	0	2	11	1	1	1	1
0	100.0	9	9	0	0	0	0	2	5	0	0	2	5
0	100.0	21	21	0	0	0	0	1	19	1	6	0	0
0	100.0	231	231	0	0	0	0	18	131	0	0	10	28

1924, yet only 58 per cent of this amount was generated by the 28 plants of one industry, the lumber industry. It would appear, therefore, that the central station industry in California has made large progress toward the elimination of the private generating plants.

Washington, the second most important state of the section in so far as power is concerned, is only 46.9 per cent electrified. This comparatively low

degree of electrification is due to the fact that the lumber industry, which accounts for two-thirds of the installed power of the state, is only 27.1 per cent electrified. In fact, this is the only industry in the state which is under 69 per cent electrified. The state of Washington has a power installation of 593,330 hp., of which 60,892 hp. is in private electric generating plants. The manufacturing plants of the state consumed a total of

Table IX—Distribution of the Industrial Power Load in Idaho

Industry	Total Primary Horse- power	Primary Horsepower				Electric Motors Run by Purchased Energy, Hp.	Electric Motors Run by Energy Generated in Private Plants, Hp.	Boiler Horsepower
		Owned by Establishments Reporting						
		Steam Engines (Not Turbines)	Steam Turbines	Internal- Com- bustion Engines	Water Turbines			Number
All industries	72,146	37,005	9,722	1,714	429	23,276	11,064	117
Chemicals and allied products	431	390	0	3	0	38	0	2
Food and kindred products	15,388	5,840	261	143	389	8,755	2,246	18
Iron and steel and their products, not including machinery	10	0	0	0	0	10	0	0
Leather and its finished products	8	0	0	0	0	8	0	0
Lumber and its allied products	43,054	29,570	9,461	1,069	40	2,914	8,818	90
Machinery	324	0	0	0	0	324	0	0
Metal and metal products other than iron and steel	4,160	0	0	0	0	4,160	0	0
Musical instruments and phonographs	0	0	0	0	0	0	0	0
Paper and printing	512	0	0	9	0	503	0	0
Railroad repair shops	6,415	690	0	0	0	5,725	0	1
Rubber products	0	0	0	0	0	0	0	0
Stone, clay, and glass products	1,664	465	0	480	0	719	0	5
Textiles and their products	48	0	0	0	0	48	0	0
Tobacco manufacturers	0	0	0	0	0	0	0	0
Transportation equipment, air, land and water	91	50	0	10	0	31	0	1
Miscellaneous industries	41	0	0	0	0	41	0	0

Table X—Distribution of the Industrial Power Load in Wyoming

Industry	Total Primary Horse- power	Primary Horsepower				Electric Motors Run by Purchased Energy, Hp.	Electric Motors Run by Energy Generated in Private Plants, Hp.	Boiler	
		Owned by Establishments Reporting						Number	Hr.
		Steam Engines (Not Turbines)	Steam Turbines	Internal- Com- bustion Engines	Water Turbines				
All industries	23,959	10,087	3,962	1,893	98	7,919	5,107	47	11,781
Chemicals and allied products	10,374	5,130	3,375	1,017	0	852	4,606	29	8,371
Food and kindred products	5,133	2,695	408	808	98	1,124	501	9	1,411
Iron and steel and their products, not including machinery	0	0	0	0	0	0	0	0	0
Leather and its finished products	0	0	0	0	0	0	0	0	0
Lumber and its allied products	889	464	29	35	0	361	0	2	0
Machinery	149	0	0	0	0	149	0	0	0
Metal and metal products other than iron and steel	1	0	0	0	0	1	0	0	0
Musical instruments and phonographs	0	0	0	0	0	0	0	0	0
Paper and printing	406	3	0	13	0	390	0	0	0
Railroad repair shops	5,626	1,420	0	20	0	4,186	0	2	0
Rubber products	0	0	0	0	0	0	0	0	0
Stone, clay, and glass products	1,331	375	150	0	0	806	0	5	0
Textiles and their products	46	0	0	0	0	46	0	0	0
Tobacco manufacturers	0	0	0	0	0	0	0	0	0
Transportation equipment, air, land and water	4	0	0	0	0	4	0	0	0
Miscellaneous industries	0	0	0	0	0	0	0	0	0

Table XI—Distribution of the Industrial Power Load in Colorado

Industry	Total Primary Horse- power	Primary Horsepower				Electric Motors Run by Purchased Energy, Hp.	Electric Motors Run by Energy Generated in Private Plants, Hp.	Boiler	
		Owned by Establishments Reporting						Number	Hr.
		Steam Engines (Not Turbines)	Steam Turbines	Internal- Com- bustion Engines	Water Turbines				
All industries	176,076	104,057	5,276	2,146	666	63,931	28,846	288	65
Chemicals and allied products	14,661	4,670	280	68	0	9,643	3,906	17	4
Food and kindred products	62,359	44,056	1,920	1,934	658	13,791	13,086	131	29
Iron and steel and their products, not including machinery	46,123	41,595	2,560	0	0	1,968	10,728	57	19
Leather and its finished products	313	0	0	0	0	313	0	0	
Lumber and its allied products	5,047	2,924	125	83	0	1,915	0	7	1
Machinery	6,856	130	20	35	0	6,671	224	2	
Metal and metal products other than iron and steel	6,010	1,090	60	0	0	4,860	0	2	
Musical instruments and phonographs	0	0	0	0	0	0	0	0	
Paper and printing	5,430	667	33	14	8	4,708	187	2	
Railroad repair shops	8,039	2,617	0	8	0	5,414	705	3	
Rubber products	2,455	0	0	0	0	2,455	0	0	
Stone, clay, and glass products	16,484	6,094	268	4	0	10,118	0	64	
Textiles and their products	699	40	0	0	0	659	0	1	
Tobacco manufacturers	3	0	0	0	0	3	0	0	
Transportation equipment, air, land and water	717	0	0	0	0	717	0	0	
Miscellaneous industries	880	174	10	0	0	696	10	2	

456,852,000 kw-hr. of electrical energy in 1924, of which 71 per cent was purchased from central station companies. There are 17,042 motors installed in the manufacturing plants of Washington of which 43 per cent are under 5 hp.

Oregon is another state with a predominating industry, lumber, which is of a low degree of electrification. Industry as a whole in Oregon is 48.4 per cent electrified.

A Large Potential Industrial Power Field Is Yet to Be Developed

In the West as in the remainder of the nation, the future holds large potentialities for development. But the future load growth of the industry will proceed along lines different from the past. Up until the last year the central station has confined its load building efforts very largely to the taking on of new customers. The customer satur-

January 1, 1924 and Energy Consumed by the Industrial Plants During 1924

Estimated Rating of Prime Movers Used in Private Generating Plants, Hp.	Estimated Electrification of Industry Per Cent	Energy Consumed			Generators in Private Plants			A.C. Motors		D.C. Motors		Motors Under 5 Hp.	
		Total Energy Consumed, Kw.-Hr.	Purchased from Central Stations Kw.-Hr.	Generated in Private Plants, Kw.-Hr.	Total Rating of Generators, Kva.	Rating of A. C. Generators, Kva.	Rating of D. C. Generators, Kw.	Number	Hp.	Number	Hp.	Number	Hp.
7,240	42.3	(Thousands) 40,844	(Thousands) 27,514	(Thousands) 13,330	6,700	6,065	635	1,327	26,337	558	8,003	947	2 631
0	8.8	77	77	0	0	0	0	3	25	3	13	3	13
2,150	70.9	10,080	8,020	2,060	1,990	1,650	340	605	9,021	212	1,980	577	1,535
0	100.0	11	11	0	0	0	0	1	4	1	6	1	2
0	100.0	10	10	0	0	0	0	1	2	1	6	1	2
5,090	18.6	14,990	3,720	11,270	4,710	4,415	295	426	11,332	17	400	141	498
0	100.0	274	274	0	0	0	0	14	100	32	224	22	46
0	100.0	7,900	7,900	0	0	0	0	84	3,016	36	1,144	64	156
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	98.2	1,380	1,380	0	0	0	0	14	456	9	47	10	21
0	89.3	5,280	5,280	0	0	0	0	125	1,575	240	4,150	102	289
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	42.6	640	640	0	0	0	0	41	697	5	22	20	70
0	100.0	104	104	0	0	0	0	6	44	1	4	3	10
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	34.1	26	26	0	0	0	0	1	24	1	7	0	0
0	100.0	72	72	0	0	0	0	6	41	0	0	3	9

January 1, 1924 and Energy Consumed by the Industrial Plants During 1924

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		Total Energy Consumed, Kw.-Hr.	Purchased from Central Stations Kw.-Hr.	Generated in Private Plants, Kw.-Hr.	Total Rating of Generators, Kva.	Rating of A. C. Generators, Kva.	Rating of D. C. Generators, Kw.	Number	Hp.	Number	Hp.	Number	Hp.
5,230	54.9	(Thousands) 18,855	(Thousands) 9,096	(Thousands) 9,759	4,845	4,770	75	590	7,716	601	5,310	544	2,165
4,750	54.0	11,020	1,720	9,300	4,400	4,400	0	323	3,650	365	1,808	334	1,580
480	31.3	1,489	1,030	459	445	370	75	90	1,333	31	292	85	227
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	40.6	461	461	0	0	0	0	13	349	1	12	4	16
0	100.0	126	126	0	0	0	0	7	46	15	103	10	21
0	100.0	2	2	0	0	0	0	1	1	0	0	1	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	96.0	1,070	1,070	0	0	0	0	11	354	7	36	8	17
0	74.4	3,865	3,865	0	0	0	0	92	1,156	175	3,030	75	212
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	60.6	720	720	0	0	0	0	46	782	5	24	22	77
0	100.0	99	99	0	0	0	0	6	42	1	4	3	10
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	100.0	3	3	0	0	0	0	1	3	1	1	2	4
0	0	0	0	0	0	0	0	0	0	0	0	0	0

January 1, 1924 and Energy Consumed by the Industrial Plants During 1924

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		Total Energy Consumed, Kw.-Hr.	Purchased from Central Stations Kw.-Hr.	Generated in Private Plants, Kw.-Hr.	Total Rating of Generators, Kva.	Rating of A. C. Generators, Kva.	Rating of D. C. Generators, Kw.	Number	Hp.	Number	Hp.	Number	Hp.
24,858	50.4	(Thousands) 120,495	(Thousands) 87,254	(Thousands) 33,241	23,018	18,019	4,999	4,014	64,301	2,950	28,476	3,553	11,213
4,040	93.5	27,470	19,570	7,900	3,740	3,730	10	803	9,064	906	4,485	828	3,920
12,500	42.2	24,650	12,650	12,000	11,580	9,605	1,975	1,480	22,032	518	4,845	1,410	3,750
7,400	20.3	14,163	2,193	11,970	6,850	4,025	2,825	160	5,636	310	7,060	91	305
0	100.0	392	392	0	0	0	0	70	79	3	234	16	48
0	38.0	2,450	2,450	0	0	0	0	70	1,850	3	65	23	82
157	99.6	5,840	5,650	190	145	0	145	292	2,140	680	4,755	457	970
0	81.9	9,230	9,230	0	0	0	0	98	3,530	43	1,330	75	184
0	0	0	0	0	0	0	0	0	0	0	0	0	0
148	89.4	13,412	12,900	512	137	117	20	130	4,440	86	455	95	203
592	74.8	5,651	5,000	651	547	523	24	134	1,689	256	4,430	109	310
0	100.0	4,935	4,935	0	0	0	0	69	2,168	32	287	72	167
0	61.5	9,020	9,020	0	0	0	0	575	9,815	62	303	273	955
0	94.3	1,422	1,422	0	0	0	0	79	603	9	56	44	141
0	100.0	5	5	0	0	0	0	1	3	0	0	1	3
0	100.0	607	607	0	0	0	0	22	546	7	171	8	32
0	100.0	1,248	1,230	18	19	19	0	95	706	0	0	51	143

[illegible]

present time and it is doubtful if the potential number of industrial power customers exceeds 800,000. The central station must, therefore, turn to the problem of increasing the energy consumption per industrial power customer even as it must do also with its domestic customers. Industrial heating and the use of energy in electrolytic and electro-chemical processes hold the answer to this problem. It is estimated that today the national

industrial heating load totals only about 1,200,000 kw., while the potential heating load and related loads is estimated at 75,000,00 kw., or three times the present motor load.

It would appear that the electric light and power industry has come to a milestone in its progress and that the next period of its growth will involve many new problems in generation and distribution.

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		(Thousands)	(Thousands)	(Thousands)									
48,695	61.0	133,391	49,705	83,686	45,120	28,416	16,704	2,242	69,712	412	4,930	1,418	3,721
500	68.8	2,717	980	1,737	465	465	80	80	900	90	445	82	388
300	53.9	4,440	4,150	290	280	232	48	266	3,972	93	872	253	675
0	100.0	193	193	0	0	0	0	2	77	5	96	2	7
0	100.0	5	5	0	0	0	0	1	1	1	3	2	4
1,190	22.0	2,842	222	2,620	1,100	1,030	70	81	2,150	3	75	27	94
0	100.0	814	814	0	0	0	0	41	298	95	663	64	136
46,300	63.1	119,350	40,000	79,350	42,900	26,330	16,570	1,700	61,075	55	1,720	940	2,280
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	96.5	1,368	1,368	0	0	0	0	14	453	9	46	10	22
405	52.5	1,273	827	446	375	359	16	30	381	58	998	25	70
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	87.0	355	355	0	0	0	0	23	386	3	12	11	39
0	100.0	9	9	0	0	0	0	1	4	0	0	1	4
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	100.0	2	2	0	0	0	0	1	2	0	0	1	2
0	52.0	23	23	0	0	0	0	2	13	0	0	0	0

January 1, 1924 and Energy Consumed by the Industrial Plants During 1924

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		Total Energy Consumed, Kw.-Hr.	Purchased from Central Stations Kw.-Hr.	Generated in Private Plants, Kw.-Hr.	Total Rating of Generators, Kva.	Rating of A. C. Generators, Kva.	Rating of D. C. Generators, Kw.	Number	Hp.	Number	Hp.	Number	Hp.
10,264	78.4	118,290	163,422	14,868	9,464	6,998	2,466	3,327	79,874	1,747	30,644	2,744	7,523
826	76.8	6,770	5,150	1,620	765	759	6	198	2,240	225	1,110	205	970
2,820	56.5	16,510	13,800	2,710	2,615	2,170	445	1,000	14,924	351	3,280	955	2,540
0	70.0	1,830	1,830	0	0	0	0	21	728	40	912	12	39
39	7.4	82	40	42	36	0	36	2	17	8	49	4	12
0	79.6	1,673	1,673	0	0	0	0	48	1,265	2	45	16	56
0	100.0	1,875	1,875	0	0	0	0	96	705	228	1,536	153	325
5,400	86.5	136,485	127,250	9,235	5,000	3,070	1,930	1,460	52,460	630	19,804	1,120	2,720
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	98.5	2,725	2,725	0	0	0	0	27	903	18	93	20	42
1,160	94.6	4,629	3,407	1,222	1,030	985	45	110	1,387	210	3,630	90	254
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	80.3	4,065	4,065	0	0	0	0	258	4,422	28	137	123	430
19	29.0	874	835	39	18	14	4	49	370	6	35	22	70
0	100.0	2	2	0	0	0	0	1	1	0	0	1	1
0	100.0	47	47	0	0	0	0	2	42	1	13	0	0
0	82.0	723	723	0	0	0	0	55	410	0	0	23	64

January 1, 1924 and Energy Consumed by the Industrial Plants During 1924

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Electric Refrigeration Activity Will Mark Merchandising in 1926

OUTSTANDING in a year in itself notable for the results achieved is the commanding place which electric refrigeration has earned for itself in the short time since its inception as a domestic appliance. Not less interesting is the important place it is destined to play in the merchandising programs of the central stations for the year 1926. This practically new load-building appliance bids fair to compete successfully with the remarkable development of electric range business, brought to a high point in the past year by intensive merchandising.

In electric-range distribution the year 1925 proved a record-breaker in practically every section of the West. Many companies increased the number of ranges on their lines by 50 per cent, some by 100 per cent, and none by less than 10 per cent. And yet that the field is capable of still greater profitable cultivation is borne out by the fact that as yet no territory served is saturated beyond 25 per cent of the customers served, and only in one instance is so high a saturation reached.

The same general tendencies have been noticed in respect to water heaters, the estimated total number installed in the eleven Western states reaching 39,600. This class of business is being pushed in all quarters where electric ranges are sold, and the present percentage—a water heater sale to each two range sales—no doubt will be bettered under the intensive merchandising programs now under way.

Everywhere a note of optimism characterizes the prospect for the year 1926. A review of the achievements of 1925 and the normal indications of growth of the Western states gives rise to this natural feeling. The record of the year 1925 from a merchandising standpoint is a record of quotas exceeded, sales steadily increasing, and business development in general. There is a quite general feeling that, much of the pioneer engineering of lines having been accomplished, the path has been made smooth and broad for the business builder who follows in the engineer's wake. With lines and services installed, it becomes the major activity of all central stations to build up load upon these lines, to smooth out the low-load valleys with off-peak types of electrical appliances and apparatus,

ALTHOUGH all fields of electrical merchandise will be cultivated as never before during 1926, activity in the sale of electric refrigeration will advance step by step with that in the sale of ranges and water heaters. This is indicated by the plans announced by sales executives of the power companies of the Pacific Coast, related in this survey article on 1926 merchandising plans.

and to keep down rates by maintaining a better load factor.

Crystallization of the central-station merchandising idea, more or less commonly practiced in the East, found a notable instance in the announcement recently made by the Bylesby organization that its companies would inaugurate merchandising programs and open merchandising stores on a serious and complete basis. The first of such stores to be opened will be that in connection

with the Western States Gas & Electric Company's offices at Stockton, Calif.

Speaking of the merchandising policy to be followed in that instance, H. K. Griffin, commercial agent for the company, says:

"No quota has been set for electric-range sales for 1926, due to the plans for a complete appliance sales department and the consequent inclusion of range sales in this department. For the same reason nothing definite has been decided in the field of electric refrigeration. As just noted, an appliance sales department is planned for 1926. This department will be operated as a function of the new business department. A complete line of electric appliances will be handled, and every effort will be made to conduct the department along the highest type of merchandising. Further details as to the method of merchandising, kinds of appliances sold, etc., are not as yet decided. It is, however, settled that appliances will be sold on time payments, and that every facility will be offered to customers for obtaining electric appliances on terms which they can handle.

"The first store will be opened in conjunction with the general offices of the company in Stockton in the early part of 1926. It is planned that eventually the appliance sales activity will extend to all of the properties of the company, this growth being dependent upon several factors. It is quite probable, however, that sales activity will be confined to the Stockton store for several months at least.

"This company is firmly convinced of the correctness of the policy of central-station merchandising, provided it is done on the proper basis. There can be no argument as to the desirability of placing appliances and lighting load on the line of any company, for it produces additional revenue with very little, if any, capital expenditure. The

placing of this additional load is strictly a central-station job, for we cannot expect any other agency to have the same interest in it as we should have, as they do not have the same incentives."

In reviewing the merchandising done by his company during the past year, Mr. Griffin went on to state that during the year the company had sold ranges and water heaters to its customers at a price considerably lower than the manufacturers' retail list. No special campaigns were employed, the work being done entirely by the various district managers and field men in conjunction with their regular new business solicitation. Working in that manner, 52 ranges were sold during the year with approximately half that number of water heaters, ranging from 3 to 5 kw. each. No electric refrigerators were sold by the Western States Gas & Electric Company, according to Mr. Griffin, the company not having entered that field. Several machines which had been placed on the market were sold by independent agencies, Mr. Griffin said, and their performance was being watched carefully by the company to determine the character of the load and its operating characteristics.

Coast Valleys Gas & Electric Also to Merchandise Appliances

Announcing that it, too, as another Byllesby company, soon would inaugurate a merchandising policy on a large scale, the Coast Valleys Gas & Electric Company, Salinas, Calif., reported a year of excellent results in the sale of such appliances as it has handled during 1925. P. L. George, manager of the commercial department, reported that the company had sold during 1925 a total of 158 ranges, and as a consequence has set a quota of 180 ranges for its 1926 sales.

Entering the field of electric refrigeration sales early, the Coast Valleys Gas & Electric Company reports having sold 10 of the domestic machines and has set for its 1926 quota 25 more refrigerators. In selling ranges that company employs a range salesman, uses newspaper advertising, and has found free cooking schools effective sales promoters. It has held two demonstrations in small towns in the past year and plans to use the same methods in 1926.

Speaking of its special campaigns during 1925, Mr. George tells of a special lamp sales campaign which was handled through a local dealer in which the company co-operated. This sale resulted in the sale of approximately 80 kw. in lamps, filling many empty sockets in the territory served. A kitchen lighting unit campaign handled by the company was started on Nov. 16 and is still in progress.

"It has been announced," concludes Mr. George, "that this company will handle the merchandising of electric appliances as soon as we are established in our new quarters, which will be some time during the middle part of the year. The definite plans are not known at this time."

No change in merchandising policy, however, is contemplated by the San Diego Consolidated Gas & Electric Company, also a Byllesby property, at least

for the immediate future, according to the report of A. E. Holloway, superintendent of the commercial department of that company, in announcing the new year's plans.

San Diego Company Reports Good Range Sales During Year

"As you know," says Mr. Holloway, "we are not actively in the merchandising business in San Diego, leaving this mostly to the electrical dealers. However, during 1925 we carried on two or three very successful campaigns. The first campaign was the placing of 3,600 kitchen lighting units in various San Diego homes. This campaign was carried on by the company by placing salesmen directly in the field and making a house-to-house canvass. Contracts for the installation of these units were given to the electrical dealers.

"Also in co-operation with the electrical dealers the company carried on a sales campaign on electric irons. This was done completely through the medium of advertising and display, and there was no house-to-house solicitation. The campaign was carried on for a period of two weeks, and approximately 300 irons were sold.

"The company during the last year sold 437 electric ranges and electric water heaters, which we consider fairly good, due to the fact that we do not attempt to sell ranges in the territory we supply with gas. The quota for 1926 is 600.

"The company does not sell electric refrigerators, but the following refrigerators were handled in San Diego during 1925 by dealers: Servel, Frigidaire, and Kelvinator. There were approximately 350 of these machines sold by these dealers.

"The method employed in selling electric ranges is a direct house-to-house canvass, together with broadsides and newspaper advertising. The company handles two makes of electric ranges, and dealers who desire to operate with the company may do so upon a basis of a 15-per-cent commission from the company retail price where the dealer handles the account, and a commission of 10 per cent from the retail price where the company handles the account. Ranges are sold over a one-year period with the addition of 5 per cent for carrying charges.

"During 1925 the new-business growth of the company has been very satisfactory, and we have had considerable power load, and the additional load in street-lighting has been especially good. By proper presentation 586 ornamental street lighting posts were added during 1925 and 204 overhead street lighting units. The ornamental street-lighting has been greatly popularized during the last year, and we have in process of installation over 800 units which will come on in 1926. We have two special campaigns planned for 1926, one an industrial and commercial lighting campaign and the other a Red Seal campaign.

"General business conditions look exceedingly fine in this district, as a great deal of interest is being shown in better street-lighting, better store-lighting, and in the greater use of electricity in general. We believe that the domestic electric refrigerator,

having been practically introduced in this district during the last year, will receive a great volume of sales during the coming year. New construction and building work is very active, and we expect it to carry on during 1926."

Southern California Edison to Double its Sales Force

The Southern California Edison Company, with the record of a remarkable year of commercial development in 1925, plans to redouble its sales efforts and to double its sales force in 1926, according to brief announcement by W. L. Frost, general commercial manager of the company. Although not yet ready to publish plans for the year's activity, Mr. Frost stated that all efforts of 1925 would be doubled.

The Edison company is known to have had results in its kitchen lighting unit sales campaign considered excellent by all who are familiar with the situation. In its range and water heater sales, too, records of past years were known to be exceeded. A recent announcement by S. M. Kennedy, vice-president in charge of business development and public relations, would indicate that the company intends to enter the field of merchandising of electric refrigerators during 1926. It is known also that the Edison company has been getting good results from the sale of one special appliance each month, a campaign in which the Electragists of southern California have shared.

Southern Sierras Company to Sell Electric Refrigerators

Indicating that the Southern Sierras Power Company intends to merchandise electric refrigerators in 1926, although it has not previously done so, George T. Bigelow, assistant general agent, says:

"We have not sold electric refrigerators during 1925, but intend to take them on during 1926. I have not made up a quota on this as I do not know just how many men I will have working on this proposition. We will probably get started on this in February.

"Final check of our figures is not in for the year, but the number of ranges sold during the year is approximately 215. It will not vary more than one or two either way. Our quota for 1926 is not given out until February, but it will be in the neighborhood of 325.

"The only method we employ in merchandising ranges and the one we will employ in merchandising refrigerators is to put on salesmen who receive salary but no commission and who work steadily on the job without special campaigns. It is my belief that in this way we get the most kilowatt-hours for our money and kilowatt-hours that stay on the lines, and also develop the men so that they become useful utility men rather than transient high-pressure salesmen. We have not done any spectacular work during 1925 and do not expect to put on any special campaigns in 1926. I have found this type of work adapted to our small, scattered community.

"1925 has been, from a commercial standpoint, the best year we have had in every particular. The

power load has increased to a most gratifying extent, and the heating and lighting load is building up in a most satisfactory way.

"We have maintained our range saturation of ten to one, possibly lowering it a little bit when actual figures are in, and have been able to increase our water-heater sales over fifty per cent.

"I see no reason why 1926 should not be equally as good, and we feel rather confident of making it a better year."

San Joaquin Power Has Remarkable Record

One of the most consistent and thorough programs of commercial development was reported by the San Joaquin Light & Power Corporation, of Fresno, which merchandises through its subsidiary, the Valley Electrical Supply Company. For all 'round commercial development the report of the past year's activities and the program for 1926 of the latter show the company to be a distinct leader in merchandising and load-building from an industrial and agricultural standpoint. A. M. Frost, manager of sales, reporting for the San Joaquin and Midland Counties systems shows that for the year 1925 the load increase signed up was:

5,463 kw. in lighting.

11,090 kw. in heating and cooking equipment.

14,791 hp. in industrial and oil-field motors.

29,526 hp. in agricultural motors.

"During the year 1926," says Mr. Frost, "we are making a special sales effort in industrial and commercial lighting and industrial power and heating. To cover this activity, three men have been added to the general sales organization to cover the system. During the year these salesmen will visit every industry we are serving, for the purpose of determining whether or not our service at the present time is satisfactory and used in the most efficient and economical manner, and to sell additional service where such sales can be proved to be of benefit to the customer. These three men are in addition to the present general sales organization and will work in the districts, aiding the district salesmen in every way possible.

"Twenty-eight members of the sales organization will, this year, take the lighting and power sales courses of the National Electric Light Association. The organization of this educational work will be handled through this office under the direction of H. N. Carroll."

Supplementing Mr. Frost's remarks, and dealing particularly with the merchandising of appliances, H. H. Courtright, president and manager of the Valley Electrical Supply Company, the merchandising subsidiary of the San Joaquin Light & Power Corporation, relates the achievements of that organization in 1925 and its plans for 1926.

Campaign on One Appliance Each Month

"During the year 1925 we have campaigned one electrical appliance each month, and, as this program has proved very successful, this policy will be continued through the year 1926, only on a larger scale.

"As to any commercial achievements, we believe

our plan of featuring a special appliance once a month and our fireless-cooker sale were our outstanding achievements in our merchandising sales. A report of our fireless-cooker sales has previously been published in your Journal. (See Journal of Electricity, Sept. 1, 1925, p. 183.)

"During the year 1926 you will note that the quota is considerably above the actual sales of 1925. The figures are high but we feel we will reach them before the year is over."

The report of the electrical merchandise sales for the year 1925, and the quota for 1926, is as follows:

APPLIANCES	Sold During 1925	Quota for 1926
Ranges	739	1,000
Water Heaters	605	800
Heavy Duty Appliances.....	237	300
Ice Machines	34	50
Large Air Heaters.....	209	500
Cookers	4,185	6,000
Heaters	997	3,000
Irons	1,182	1,400
Percolators	1,423	2,500
Toasters	1,712	2,500
Table Stoves.....	411	500
Fans	876	1,200
Waffle Irons.....	569	1,500
Vacuum Cleaners.....	354	400
Heating Pads.....	221	500
Boudoir Lamps.....	480	1,000
Curling Irons.....	342	600
Soldering Irons.....	180	300
Small Motors.....	217	400
Lighting Fixtures:		
Residence Lighting Fixtures.....	2,697	3,500
Store Lighting Units.....	1,561	2,000
Window Lighting Reflectors.....	401	600
Spotlights—Window	27	50
Kitchen Lighting Units.....	5,370	7,000

Complete text of the sales policy of the Valley Electrical Supply Company as regards ranges, water heaters, and heavy-duty appliances, may be of interest.

The Valley Electrical Supply Company salesmen will assist the dealer in making sales on ranges, water-heaters and heavy-duty appliances, or will make the sales and place them through the dealer.

All sales are to be placed with the dealer or dealers within the immediate territory in which the equipment is sold.

This service is given to the dealers or merchants who will co-operate with the San Joaquin Light & Power Corporation and the Valley Electrical Supply Company in putting over this range, water-heater and heavy-duty appliance campaign.

When sales are made by the Valley Electrical Supply Company salesmen, the salesmen must inform the purchaser of the nearest dealer or merchant that is co-operating with us in this campaign, the purchaser to select the dealer or merchant with whom he wishes to place his order.

Should the purchaser wish the Valley Electrical Supply Company salesman to place the order with some responsible dealer or merchant, then it is the duty of the salesman to use his best judgment in placing the order. Should there be two or more dealers in the immediate vicinity, the order should be placed with the firm that is most entitled to the sale. Should one firm be securing the majority of the sales and be co-operating enthusiastically with us in our campaign and the other firm be giving our campaign very little help and making few sales, then in that case the first-mentioned firm is entitled to the sales.

The placing of these orders should be given very careful thought for our co-operation dealers and merchants are entitled to fair play and must have it. This point spells success or failure of our "through the dealer sales plan."

Consigned Range

The Valley Electrical Supply Company will consign one Hotpoint or Westinghouse domestic electric range with any dealer or merchant who will co-operate with them in making

this campaign a success, it being strictly understood that the consigned range be given prominent display space on the sales floor in his store, and further that the range is the property of the Valley Electrical Supply Company, and must be displayed at all times. At no time can it be sold to a consumer. A consigned contract, specifying the range desired, must be signed by the dealer or merchant before the range is shipped to them.

Terms

Should the dealer wish to sell this equipment on terms of so much down and so much a month and not wish to carry the terms paper, then it is the duty of the Valley Electrical Supply Company salesman to advise him to consult his banker or some finance corporation before making sales of this kind.

Pacific Gas and Electric Adds Greatly to its Connected Load

Following up the 1925 increase of business in its many lines of activity, the Pacific Gas and Electric Company will carry on the good work in 1926 in many fields of endeavor, according to R. E. Fisher, vice-president in charge of public relations and sales. Although not to sell electric refrigerators itself, confining its merchandising operations to ranges, air heaters, water heaters and lighting, that company intends to co-operate with the dealers toward the better distribution of the refrigeration appliances. Says Mr. Fisher of the past year's activities:

"The number of electric ranges sold by the company during 1925 was 3,031, with a resultant total connected load of 21,380 kw. In 1926 our quota is set at 5,000 ranges, and we hope to put on a connected load of 34,000 kw.

"The water heaters sold in 1925 were 1,262, with a total connected load of 6,009 kw. For 1926 our quota is set at 2,500, with a resultant connected load of 11,750 kw.

"Air heaters sold in 1925 amounted to 3,293, with a total connected load of 10,939 kw. For 1926 our quota is set at 7,000, with a resultant connected load of 23,000 kw.

"The number of electric refrigerators sold on the lines of our company in 1925, as close as can be determined, is 875, and the quota set for 1926 is 2,000. The 2,000-quota includes both domestic and commercial refrigeration units and machines and will result in a connected load of 500 kw.

"In view of the splendid dealer co-operation which is enjoyed at the present time, through dealers handling refrigerators and units, both domestic and commercial, we are positive that they can promote this business to better advantage by receiving our co-operation, through dealer encouragement, servicing, advertising, and special contact through our sales personnel.

"The methods which we will employ in merchandising electric ranges throughout 1926 will conform very closely to the plan of 1925. Very slight changes will be made to this plan. The principles will not be changed in any form, except that in certain cities the flat installation price will be raised. These cities have not, as yet, been designated, but will be as soon as the completed report of the installation costs is received."

No actual merchandising of refrigerators or units will be employed, Mr. Fisher goes on to state, and continues:

"The most spectacular commercial achievement along the merchandising sales lines in 1925 was the progress made in kitchen lighting unit sales, having set a quota of 20,000 kitchen lighting units for the six-month period—July to December, inclusive—and the accomplishments showing that 31,970 were disposed of.

"In addition to that we feel that the accomplishments made on industrial heating sales for the year were very much to be proud of; 2,404 kw. of industrial heating equipment was added as against 538 kw. in 1924.

"The only special campaign plan for 1926 will be one to handle the sale of portable table lamps, of which we propose to dispose of 4,500, which will add 450 kw. to our lines. This campaign will start in February, continue in March and April and be held again in October, November and December.

"Kitchen lighting unit sales activity will continue during January, February and March and then will be postponed until Sept. 1, after which it will continue to the end of the year.

"During the months of May, June, July and August a special house-to-house activity on refrigeration machines and units will be in effect. Prospects that are received will be turned over to the local refrigeration dealers for closing.

"The electric sales accomplishments during 1925 have been highly satisfactory. This was made possible through the splendid co-operation received from all branches of the industry, and we are optimistic and look forward to much greater activity in sales during 1926."

Coast Counties Employees Make Record in Kitchen Light Unit Sale

Remarkable results were obtained by the Coast Counties Gas & Electric Company in its kitchen lighting unit campaign, as well as in its range sales during 1925. Serving a territory of 13,000 customers, a quota of 1,000 kitchen lighting units was established, and the fourth day after the campaign started the company had placed 1,287 units in operation. Believing in taking its own medicine, the entire personnel of the company itself first was sold kitchen lighting units, and once completely "sold" themselves, the employees were released to sell units to the community. The results were nothing short of amazing in some instances, it being reported that one gas service man in Gilroy sold 80 units. Another gas man, on his day off, sold 16 units. An electric trouble man in Santa Cruz sold 70 units, and a bill collector sold 60 units. Even the wives of employees were in the field selling the units. And soon the quota for units was raised from 1,000 to 3,000.

Of its range sales activities, M. F. Wales, general agent of the Coast Counties Gas & Electric Company, says:

"During 1925 we sold 121 electric ranges and 55 water heaters. We did not carry a line of electric refrigerators and consequently sold none. The method employed in merchandising the ranges was as follows: The company purchased ranges in car-

load lots and sold them through the medium of employees and one regular salesman.

"Our salesmen and employees assisted the dealers in making any sale in which the dealer requested help, and ranges were sold to dealers at our wholesale cost. We have fixed a quota of 175 ranges for 1926."

Truckee River Power Company to Sell Refrigerators

Although not having engaged in merchandising activities until now, the Truckee River Power Company will engage in the sale of electric refrigeration in 1926, according to O. S. Clifford, commercial agent. "We do not merchandise either electric ranges or refrigerators," says Mr. Clifford, "however, we plan to handle refrigerators during 1926."

California Oregon Power Company Not Ready to Announce Plans

With the year's reports not to be completed until about the end of January, the California Oregon Power Company, according to W. M. Shepherd, vice-president and general agent, will not be able to report on the year's activities which, however, are known unofficially to have been consistently in keeping with the company's engineering growth during the period. Plans for the new year, too, were not in sufficiently definite form to allow of announcement.

Portland Electric Power Company Exceeds Range-Sales Quotas

Also intending to enter the field of electric refrigeration sales, but with the idea in mind of protecting the ice manufacturer inasmuch as possible, as well as pushing range sales in customary fashion, the Portland Electric Power Company looks forward to a favorable year in 1926. A. C. McMicken, sales manager, in reviewing the year's activities, comments as follows:

"Our merchandise sales for the year 1925 have been very satisfactory, our principal effort being put behind the sale of electric ranges. A quota of 2,000 range sales was reached, and it is our plan to sell at least 2,500 in 1926. Spring and fall campaigns of from thirty to forty-five days each will be conducted, and in addition we will adhere to our usual policy of pushing range sales every day in the year.

"Early in 1926 we will actively begin the sale of domestic electric refrigerating plants, and intend so to conduct our sales efforts as to promote the sale of all such equipment handled by the dealers in the territory we serve. We also hope to assist the manufacturers of ice in a greater sale of their product through advertising that will point out to our customers and the public the desirability and necessity of refrigeration for the proper preservation of foods.

"The present outlook for the sale of electric current-consuming devices in our territory for the year 1926 is excellent, and we believe that sales of all electric merchandise will exceed previous years."

Pacific Power and Light a Pioneer in Refrigeration Sales

Co-operation with the manufacturer of the electric refrigerator which it has been selling, in the way of advertising and sales promotion, is expected by the Pacific Power and Light Company, a pioneer in the sale of electric refrigeration. According to V. H. Moon, appliance sales superintendent:

"It is our belief that the coming year will bring us more domestic electric refrigerator sales than in the past. The manufacturer whose product we are selling will advertise directly in our districts and we will tie up with this advertising by a special campaign in the spring of the year. In addition to the spring campaign we intend to put considerable effort on refrigeration throughout the year. Last fall we placed about twenty-five machines among our customers for trial throughout the winter months, and undoubtedly this same procedure will be used again next fall. We confidently expect to place in the neighborhood of 150 refrigerating plants during the year.

"We expect to carry on a campaign on electric ranges during the months of May, June and July, 1926. These months have been used successfully in the last two years, and we believe that this year we will be able to place more ranges with our customers than in either of the two years past. The range campaign will be conducted with the aid of newspaper advertising, cooking schools and a competitive prize plan between company districts, and again we will concentrate vigorously only in those districts in which we do not sell gas. We contemplate a sale of 300 ranges during this period."

Northwestern Electric Company Will Conduct Four Campaigns

Expecting to exceed its range sales of 1925 by at least 500 ranges, the Northwestern Electric Company has set itself the goal of 2,000 ranges for 1926, according to J. C. Plankinton, sales manager, who says:

"During 1926 we will again vigorously push the sale of electric ranges in the expectation of reaching a quota of 2,000 installations. This quota is 500 greater than that set for 1925, but our success in placing 1,500 ranges last year, coupled with a consideration of the apparent prosperous outlook for 1926, leads us to this optimism regarding the possibilities. We will conduct the usual four campaigns, a spring and fall campaign of six weeks duration each, and a summer and winter one of four weeks each.

"Beginning in March and extending through April and May, special effort in the nature of a campaign will be put upon the sale of domestic electric refrigerators. The backs of customers' bills will be utilized for printing our advertisements of refrigerators, and considerable newspaper space during this period will be devoted to refrigeration. By way of making a start in this activity last year, we installed late in the fall several machines to remain on trial through the winter and until the first of March. We have every reason to believe that the great majority of these trial installations will

be converted into sales, and if this policy proves successful, it will probably be utilized again next winter when normally the refrigerator business is quiet."

Mountain States Company Will Sell Ranges and Refrigerators

Although its plans for the year were not considered complete enough for announcement, the Mountain States Power Company intends to sell both refrigerators and ranges during 1926. F. L. Brewer, sales manager, states:

"At the present writing our plans for merchandising electric ranges and domestic electric refrigerators are not complete. We have not yet selected the type of refrigerator we are going to handle, and our range program is still somewhat unsettled. We do, however, plan to push the sale of both appliances in our territory."

Tacoma Will Make Entire Year a Range Campaign

With Cushman power to be available early this year, the Department of Light and Water, City of Tacoma, will conduct its range sales upon a year-long campaign. Says Llewellyn Evans, superintendent of electric works:

"We have definitely decided not to run our range business on a campaign basis next year, but rather we would say that the whole year will be one big campaign, because we are going to bring in our Cushman power. We will not concentrate on the range of one manufacturer at any one time, but we will take all the lines that we have been selling and stress them all continuously, using our mailing list and newspaper advertising. With the sale of 527 ranges during 1925 we have just closed the most successful year in the history of our range department. The coming year promises to produce even greater results."

Seattle Sets \$600,000 Sales Quota and Will Open Branch Stores

Newspaper advertising and intensive sales effort is to be given ranges, water heaters, air heaters and refrigerators, according to J. D. Ross, superintendent of the light department, city of Seattle, who announces his sales policy as follows:

"We expect to push the sale of electrical appliances, especially the heavy-duty lines such as ranges, heaters, restaurant equipment, etc., during 1926, and will use a liberal amount of newspaper advertising to assist us in exceeding our sales quota of \$600,000, which we have set for the year. We also expect to open branch stores in different districts of the city and to conduct demonstrations of electric cooking in these stores."

Puget Sound Power & Light Company Will Carry on Customary Campaigns

"We have not at this time definitely set up our plans for merchandising electric ranges and refrigerators for 1926," says R. W. Lindley, merchandise sales manager for the Puget Sound Power & Light Company. He continues: "We are preparing, however, for our customary range campaigns, and also

for pushing the sale of domestic electric refrigerators."

Vancouver, B. C. Electric Railway to Hold Cooking Schools

Considering the price of electric refrigerators in Canada as too high for widespread distribution at the present, E. E. Walker, sales engineer for the British Columbia Electric Railway Company, Vancouver, B. C., says that major effort in 1926 sales programs will be on ranges, but that refrigerators also will be handled. His statement follows:

"Although we have not yet definite plans for merchandising electric ranges and domestic refrigerators for 1926, we do expect to sell these appliances, and at the time of writing are working out the details of our program. Tentatively, we are aiming at a quota of 500 ranges for the year in the Vancouver district, concentrating principally on a two-months campaign during May and June. We will feature small down payments with subsequent payments extending over sixteen or eighteen months, and are attempting to arrange for a five-day cooking school sponsored by one of the local newspapers some time during the month of April. This plan is subject to possible revision.

"We consider the price of electric refrigerators too high for us to expect a great volume in refrigerator sales. We handle a machine that is high-grade and satisfactory in every way, but do not expect to make many sales this year on account of the high price."

Victoria Division, B. C. Electric Contemplates Prosperous Year

"While 1925 was a year full of steady progress for the Victoria branch of our company," declared S. J. Halls, manager light and power department of the Victoria, B. C., division of the British Columbia Electric Railway Company, in describing the prospects for commercial development in that territory, "we contemplate a still more active year in 1926 in the lighting, power and appliance business. Campaigns on electric ranges, as well as other appliances, are planned for the spring months of 1926. While the company co-operates fully with all electrical dealers in their merchandising efforts, it operates two retail stores in Victoria, and carries a full line of domestic appliances for the home. Through its home service department the company is in a position to render its customers an efficient personal service.

"With a bountiful wheat crop and business generally on the up grade, we cannot help but feel optimistic as to the prospects for us in Canada during the current year. Benefiting from improved local conditions, and from the splendid support extended by manufacturers in educational campaigns and national advertising, the electrical industry here as a whole should enjoy in 1926 the best year of its existence."

With two range campaigns scheduled and a plan for the intensive merchandising of refrigerators, The Washington Water Power Company looks forward to a year of strenuous merchandising ac-

tivity. R. B. McElroy, assistant sales manager of the company, reviews the prospect concisely.

Two Campaigns Scheduled by Washington Water Power Company

"We plan to continue our intensive selling program on electric ranges during 1926 by having two campaigns as in the past. The first one will start about April 1 and continue for six or seven weeks; the second will run from the middle of July to the first of August. The incentive for customers to buy during these campaigns will be the exceptionally easy terms offered, a method found so successful in the past, combined with the offering of a suitable premium with each range purchased. During the other months of the year we will continue to exert our usual effort toward the selling of ranges. Mr. McElroy continues:

"In the sale of domestic electric refrigerating plants we hope to double the results of 1925, which will mean the sale of approximately 300 plants. It is not our intention to conduct any short-term intensive campaign on these plants, but simply to push the sale of them continuously month by month, offering them at a small down payment followed by low monthly payments as heretofore. We cannot help but feel that the 150 satisfied purchasers of 1925 will, by their boosting, prove to be a stimulating influence to our 1926 efforts, and that we will reach the quota set.

"The year 1925 has been an exceptionally good one for us. Our total range sales have broken all previous records, and in view of the favorable outlook for general conditions in 1926, we feel safe in forecasting for the current year results even better than those of the year just ended."

Idaho Power Company Sets Itself High "Bogie" for Sales

J. F. Orr, sales manager for the Idaho Power Company, maintains that his company expects to sell 1,500 ranges and 250 refrigerators in its many stores throughout its territory in 1926. His statement is:

"Our 1926 sales program calls for concentrated effort in the sale of both electric ranges and refrigerators. We have set up a 'bogie' of 1,500 ranges and 250 refrigerators, to be sold during the year. These quotas have been divided among the various stores scattered over the territory we serve and a definite 'bogie' given to each. Last year we sold approximately 1,000 ranges, and in view of the prospects for the current year we feel justified in setting a higher mark at which to aim."

Utah Power & Light Company Will Repeat Spectacular Washer Sale

A record of 1,265 washers sold in its March campaign on washers last year will call for similar activity this year, together with intensive sales of ranges and refrigerators, it is stated by P. M. Parry, commercial manager, Utah Power & Light Company. Reporting excellent results in its range and refrigerator sales in 1925, that company will employ much the same sales methods for the distribution of major appliances in 1926.

"There were 1,046 electric ranges sold during the year 1925," Mr. Parry reports, and goes on to say, "We will probably set our quota for 1926 at 1,200, and hope that sales will run somewhere near 1,500 ranges for this year.

"Refrigerator sales for 1925 will run between 85 and 90. This small number of sales, of course, is due to the lateness of the season when we actually started, and the initial effort to promote refrigeration. We will probably set as our goal for 1926 700 refrigerators.

"We expect to continue to use the same scheme in 1926 on ranges and refrigerators as formerly established, namely, the intensive solicitation for both classes of business by outside salesmen, backed by a rather liberal amount of advertising, as well as a tie-in with the floor display and inside selling. It is our intention to have our outside salesmen devote themselves almost entirely to the sale of ranges and refrigerators during 1926.

"Probably the outstanding merchandising activity during 1925 was, so far as gross volume of business was concerned, our automatic washer campaign in March when 1,265 machines were sold. We expect to conduct such a campaign again during 1926, and this campaign, together with the activity on ranges and refrigerators mentioned above, will be our special campaign plans for 1926. It is our intention, however, to attempt to work in other campaigns on smaller devices, such as floor lamps, irons, percolators, etc.

"At this time it looks as though our gross sales for 1925 will just about equal the sales of 1924, although it should be borne in mind that the year 1924 was one of the very best years we have ever had in the sale of electrical merchandise. Nineteen twenty-six promises to be very good, although it looks at the present time as though we will have to expect the improvement shown for 1926 to appear in range and refrigerator sales."

Great Western to Extend Home Service

"Our program for 1926 includes the addition of new men and improving the personnel in our 'Home Service Department' which is anticipated will promote improved conditions during the coming year," says F. H. Woodward, general sales manager for the Great Western Power Company of California. Of the past year he goes on to state: "Our total new contracted load was 45,997 kw., which represented 8,631 new consumers. Our total connected load is now 514,971 hp., and our consumers number 57,060.

"During 1925 we contracted for 1,014 electric ranges, 315 domestic water heaters, and 605 domestic air heaters, totaling 9,100 kw., in addition to 1,500 kw. of commercial heavy-duty cooking and heating equipment.

"We have reason to believe that 1926 holds out splendid inducements for new business as well as a big improvement over previous years in the electric range, air and water-heating field, our quota being 1,500 ranges for 1926.

"We have made no decision to handle electric refrigerators and hope they can best be marketed by

distributors. We are, however, offering our co-operation and support to manufacturers placing this very necessary equipment before our consumers. We have no record of the number of refrigerators installed on our lines in 1925 but anticipate that 1926 will show an advanced improvement.

"Our method for merchandising electric ranges will be similar in 1926 to those during the last five years by direct sales contact and co-operation with the dealer, specializing with the home owner and the housewife supervising her own kitchen. We have found this to be the best field.

"The localities which are served by this company are being rapidly developed. The demand for power for industrial and commercial purposes, electrical advertising, illumination and domestic service is becoming greater year by year. We hold that 1926 will show a marked gain in the consumption of electric energy on our system."

Colorado Companies Plan to Outdo 1925

Although definite work as to the programs for the year 1926 was not received from the Colorado power companies, it is known from previous statements that a like development of merchandising in that territory was experienced. In the case of the Public Service Company of Colorado, especially, was merchandising carried on in a manner which is to be equalled by few if any other Western company. With a large store devoted to the sale of electric appliances of every kind, that company is known to have developed its load-building to a high degree. In commercial lighting, Denver is rated as one of the first cities of the country.

Altogether the year 1925 may be said to have been one of exceptional commercial enterprise in the electrical industry. And the central stations of the Western states, in extending their activities in the commercial development of their respective utilities, have been fulfilling the destiny expected of them. The West has given the world some of its greatest electrical engineering achievements. To be consistent with these works, and to build a normal and well rounded future, it has been given to the commercial departments of the Western utilities to back up the engineering works with load-building commercial enterprise, which will not only make necessary the further initiative development of engineering to meet future needs, but also will give a solid foundation of commercial demand for the works that have already been accomplished.

That 1926 will find the central stations still more thoroughly cultivating the fields of their commercial possibilities is evidenced in the foregoing statements made by the leaders in this commercial work for these many utilities. That the end of 1926 will find the business of generating electricity to be approaching nearer the goal of more complete service electrically to the public, there can be little doubt. This is one industry which, in the extension of its facilities to those it serves, creates a better and more worth-while life. And it has been visioned as the province of the commercial men of the industry to bring this ideal nearer to realization.

IDEAS FOR THE CONTRACTOR

Electrical Estimating for the Contractor — VII

Layout of Motor-Generator Sets for Charging Storage Batteries Protecting Against Current Reversal

By J. R. WILSON*, Engineering Department, Los Angeles Electric Works

Each estimator undoubtedly has some particular class of job which he prefers to figure. To the electrical estimator who is really interested in his work, those jobs which present something a little bit different from the ordinary run of estimating problems are the ones from which he derives the most pleasure.

To solve some problem which at first glance seems to be impossible, or to devise some new application of electricity, are the things that make electrical estimating worth while. In this article of the series the job to be discussed presented one of those problems.

No claim is made for perfection of the manner in which the problem finally was solved, but it does represent the result of considerable thought being given to the problem. Some readers may have different ideas on this problem, and their solutions will be received gratefully by the writer, care Journal of Electricity, and will be published.

As most electrical men know, the most serious problem met with in the charging of storage batteries on a commercial scale is in guarding against current reversal. In using motor-generator sets for charging batteries some

means always is provided to prevent the generator being driven as a motor should the alternating current supply fail for any reason.

In the installation under discussion the specifications read as follows:

1. Provide and install two motor-generator sets, one of 25-kw. capacity and one of 15-kw. capacity, both 125-volt d.c.

2. Provide and install full automatic and manual control equipment to meet the following conditions:

3. A.c. service shall be 440-volt, 3-phase, 60-cycle and shall enter at the first floor level. Place service switch and meter in basement at location of a.c. switchboard.

4. Motor-generator sets and a.c. distributing and control panels shall be located in basement where directed. Also d.c. fused main switches.

5. Direct current main switchboard and feeder switches shall be located on third floor in battery charging room.

6. It is the intention of the owners to operate either machine separately or both together, feeding into one common d.c. bus. The characteristics and speeds of each machine shall be such that the above mode of operation will be possible. All necessary protective devices shall be furnished and installed to make machines non-interfering.

7. Machines shall be so wired and equipped that it will be possible to start or stop either or both machines from either the basement or third floor. Also that they may be stopped at basement and re-started at third floor or vice versa.

8. Should a.c. supply fail and machines stop, devices shall be provided to prevent battery load feeding back and running generators as motors. Upon resumption of a.c. current supply, generators shall return automatically to operation, but d.c. current shall not be fed into d.c. bus until generator shall have reached full operating voltage.

Possibly some of our readers will consider the above layout very simple, but to others it will present an interesting problem.

The wiring diagram shown in Fig. 1 is the one finally adopted as being correct. The installation has not been completed at the present writing, but the layout has been checked by engineers of the General Electric Company and approved for operation. The wiring layout also has been approved by the local electrical inspection department.

The equipment data on this installation is as follows:

Machine No. 1—25-kw., 125-volt, 1,150 r.p.m. Westinghouse Type S, direct-current generator, direct-connected through flexible coupling to 40-hp. G. E. 440-volt, 1,150 r.p.m. 3-phase motor.

Machine No. 2—15-kw. generator of same make, type and speed, to Westinghouse type C.C.L. 30-hp., 1,150 r.p.m. 440-volt, 3-phase motor.

Compensators—General Electric automatic, type C.R., 7051-J 1.

Control Buttons—General Electric C. R. 2940-B.S.12M. (Start and stop—interlocking.)

Protective Relays—General Electric type P.Q. definite time delay—circuit closing. (Max. delay 30 seconds.)

D.C. Contactors—General Electric type C.R. 7002 2-pole, 300-amp. (Cat. No. 1771681 G3.)

D.C. Main Switches—2-pole, 400-amp. fused—externally operated.

The rheostats and meters were of standard make and proper capacities.

Should any unforeseen developments arise when this plant is placed in operation, they will be noted in a later article in this series. Any comments or suggestions on this layout or any other appearing in the series, will be welcomed by the writer.

Prominent San Francisco Man Builds an All-Electric Home.—A home completely equipped electrically recently was built on Corinthian Island for E. H. Pauson of San Francisco. The electric equipment includes a Howard electric range, a Wesix water heater, and Majestic air heaters. The installation was made by Perry & Johnson, electricians of Sausalito.

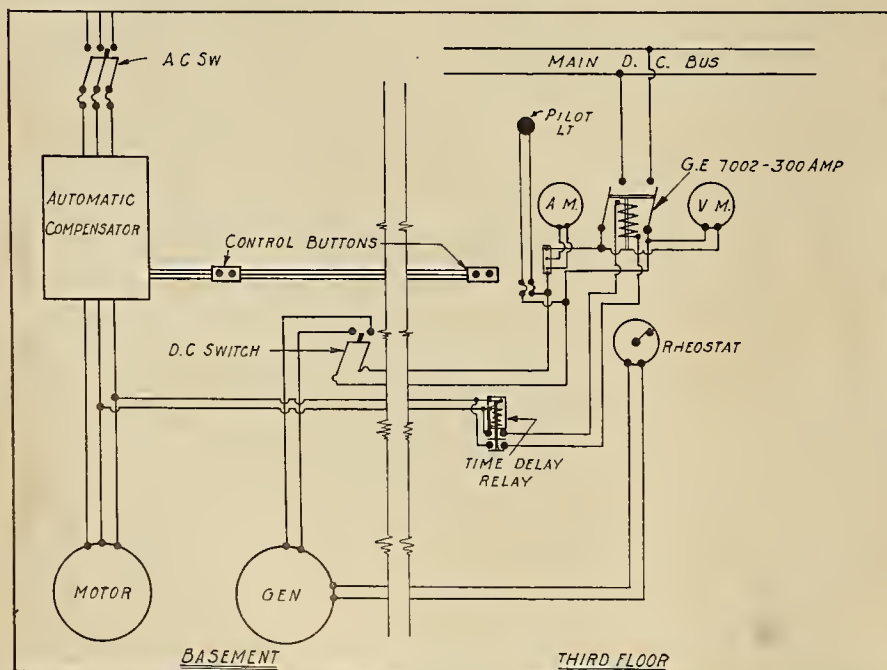


Fig. 1. Wiring diagram for each motor-generator set installed for charging storage batteries. By this method the system is protected against current reversal should the alternating current supply fail.

What Price-Cutting Costs

From the Los Angeles office of the Standard Sanitary Manufacturing Company comes a concise statement of the effect of price-cutting on profits.

"The following compares the percentage of price-cut with the additional volume of business necessary to hold up profits to a certain definite level:

"On 25 per cent margin of profit a cut of 5 per cent requires 18⅔ per cent more volume.

"Eight per cent cut requires 35⅓ per cent more volume.

"Ten per cent cut requires 50 per cent more volume.

"Twelve and a half per cent cut requires 75 per cent more volume.

"Fifteen per cent cut requires 112½ per cent more volume.

"In other words, if you cut the price 15 per cent on a \$100 sale, it is necessary to sell \$112.50 worth of additional business before there can be a \$25 profit provided for in the original sale."

Modern Building Completed by Los Angeles Electragist

Probably one of the finest electrical establishments in the West has been completed by H. H. Walker, electragist of Los Angeles. The building is of Spanish architecture. It contains three stories and basement and is approximately 50 x 90 ft. In addition to the building a large service yard with sheds at each side for trucks is provided.

The first floor is given over to the merchandise store and warehouse space for handling heavier material. In the merchandising room the Spanish idea has been carried out throughout. The fixtures were built to order after old Spanish designs and the floor is red Spanish tile.



This building is the new establishment of H. H. Walker of Los Angeles. The prominent position of the word "electragist" is significant.

In the retail business of the firm Mr. Walker is looking to the future, and novel and attractive salesrooms have been fitted up to make easy the selling of electrical appliances.

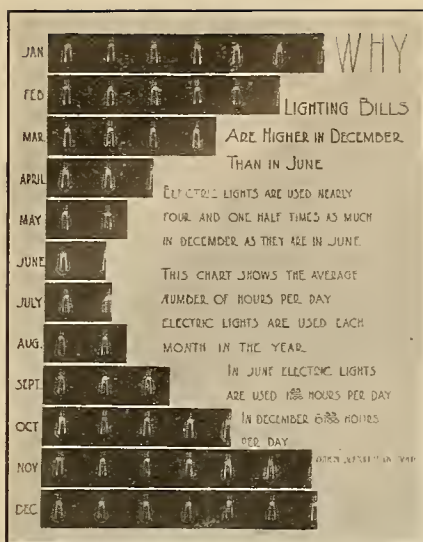
The second floor is used for general and private offices. Mr. Walker's own suite consists of two offices, his own and the consultation room. The consultation room is paneled in hardwood and presents a very attractive appearance.

The third floor is devoted to storage space for lighter material and club rooms for the employees. The club rooms contain a billiard table, shower baths and locker rooms, which form part of a complete and up to date club.

Mr. Walker is president of the California Electragists, and believes in getting the word "electragist" before the public. The sign across the front of his establishment reads, "H. H. Walker, Electragist."

Volt Loss	#14	#12	#10	#8	#6	#4	#3	#2	#1	#0	#00	#000	#0000	250	300	350	400	500	600	700	800	900	1000	1500	2000
	15A	20A	25A	35A	50A	70A	80A	90A	100A	125A	150A	175A	225A	250A	275A	300A	325A	400A	450A	500A	550A	600A	650A	850	1050
1.0	13	15	19	21	23	27	30	33	38	40	43	42	44	49	52	55	57	61	64	66	68	70	80	87	
1.5	19	23	29	33	36	41	46	50	59	59	62	66	64	67	75	80	84	88	93	97	100	105	108	123	133
2.0	25	31	39	44	48	52	61	70	78	78	82	88	85	90	100	105	112	117	125	130	133	138	143	163	175
2.5	32	39	49	52	60	70	76	86	100	100	105	110	108	102	125	134	140	146	155	160	167	173	176	205	220
3.0	38	47	59	63	72	82	92	105	120	120	125	132	128	135	150	160	170	175	185	195	200	206	215	245	265
3.5	45	52	69	76	85	98	108	120	136	136	145	155	150	155	175	185	195	200	215	225	230	240	245	285	305
4.0	50	62	79	90	98	112	124	140	156	156	165	175	170	180	200	210	222	230	245	255	265	275	280	325	350
4.5	58	71	89	100	110	125	138	155	175	175	185	195	190	200	225	235	250	260	275	285	295	310	315	365	395
5.0	64	80	100	110	120	140	155	175	195	195	205	220	212	220	250	265	280	290	310	320	330	345	350	410	445
6.0	76	96	118	132	145	168	184	210	235	235	245	260	252	265	300	315	330	345	370	385	400	415	425	490	530
7.0	90	110	138	154	170	195	215	240	270	270	285	305	295	310	345	365	390	400	430	450	465	485	495	570	620
8.0	102	126	156	175	195	220	245	275	310	310	325	350	336	355	400	420	450	465	490	515	530	550	565	600	710
9.0	115	141	176	195	220	250	275	310	350	350	365	390	380	400	450	470	500	510	560	580	600	625	640	740	800
10.0	128	156	195	220	240	280	305	345	390	390	405	440	420	445	500	530	560	580	620	650	670	700	710	820	890

Voltage drop must be considered in practically every installation made by a contractor. The above table gives the maximum distance (one way) in feet over which a given current may be carried with a given volt loss. The minimum wire size is based on the requirements of the National Electrical Code. This table was prepared by E. Earl Browne, manager of the San Francisco Electrical Contractors and Dealers Association.



This chart graphically presents the reason why lighting bills are higher during the winter months. It also can be used in selling a customer better lighting by pointing out the greater length of time artificial light is necessary.

Electroliers Installed in Tract with Electric Home

The Marin County Electrical Development League recently sponsored an electric home in Morningside Court, a subdivision in Marin County between San Anselmo and Fairfax. During the ten days that the home was open 3,605 people visited it. A large number of these were interested in particular electrical features which were installed.

The home was one that was within the price range of the average person, selling for approximately \$8,000. It was complete in its electrical equipment, including a Frigidaire electrical refrigerator, a Universal range, and a Scheeline water heater. Several makes of air heaters were used, including Wesix, Majestic and Scheeline. The home was built by W. R. Quigley.

Electroliers were installed in the tract by G. R. Maclaren, an electragerist of Fairfax. Twenty-one No. 876 Union metal standards were installed. These are 11 ft. 6 in. in height, and each is topped with a 250-c.p. lamp consuming 6.6 amp.



Electric home sponsored by the Marin County Electrical Development League. One of the electroliers installed in the tract is shown in the foreground.

Questions and Answers on the Code and Safety Orders

Arrangements have been made with Claude W. Mitchell, electrical engineer of the Board of Fire Underwriters of the Pacific, to answer through the columns of the Journal of Electricity such questions on the National Electrical Code as are of general interest.

Similar arrangements have been made with George E. Kimball, electrical engineer of the Industrial Accident Commission of the State of California, to answer questions on the Electrical Safety Orders issued by the Commission.

While it is the object of this department to assist in a better understanding of the Code and the Safety Orders, replies given are not to be considered as official interpretations applying in all instances, as some of the rules permit of varying interpretations under different conditions. The questioner should be guided by the inspection department having jurisdiction.

All who are interested are invited to send in their inquiries regarding the National Electrical Code to Claude W. Mitchell, Board of Fire Underwriters of the Pacific, Merchants Exchange Building, San Francisco, Calif., or to the Editor, Journal of Electricity, 883 Mission Street, San Francisco. Questions on the Safety Orders should be sent to George E. Kimball, Industrial Accident Commission, State Building, Civic Center, San Francisco, or to the Editor.

Q. Where is concealed knob and tube wiring permitted?

A. Electrical Safety Order 703-9 (a). Concealed Knob and Tube Wiring: This class of wiring should not be confused with open wiring (see Order 703-10) but is construed to mean wiring installed within the finished walls of buildings and in normally not readily accessible places where the wiring would not be exposed to accidental contact or mechanical injury. Such locations as attics and spaces under buildings and similar spaces which are not used, or liable to be used for the storage of material, supplies or junk, may be wired knob and tube, subject to the approval of local inspection departments. Many municipal inspection departments have requirements which prohibit the use of knob and tube wiring within certain restricted zones, and all such ordinances which require a higher standard of safety take precedence of the Electrical Safety Or-

ders. The clause, "shall not be used except where expressly permitted by other sections of these orders" probably will be modified to read, "and by permission of the electrical inspection department having jurisdiction" in the next revision of the orders. The "other sections of these orders" referred to are Order 707-1 (d) and Order 711-4 (a). Briefly, the application of the Electrical Safety Orders by the Department of Safety may be considered to permit concealed knob and tube wiring within the finished walls of buildings and in normally not readily accessible locations, subject to local regulations. This is assuming that the local department is enforcing wiring requirements of a standard not lower than the Electrical Safety Orders.

Q. Are meters properly grounded when mounted on a metal meter panel which is part of an all-metal dead-front switchboard which is grounded?

A. Electrical Safety Order 707-10 (h) requires that the frames of meters and meter transformers be grounded under the same conditions that other equipment, appliances and devices would require grounding. [See Order 704 (a).] The method, however, is different. Grounding should be done as required for meters located in metal cabinets. See Order 707-10 (b).

Q. Will Electrical Safety Order 709-2 (g) prohibit switches which have the door interlocked with the switch handle?

A. No. It was the intent of the committee in writing the order to require means of access to the blades and fuses of a switch for inspection while it was in the closed position. If installed in a circuit which may be de-energized, and the switch cover then opened, a switch with an interlocking cover may be used. Enclosed switches which are not too readily accessible for the storage of supplies are obviously safer in some locations than switches with conveniently swinging doors.

Q. Should a delta-connected bank of transformers for 440-volt power be grounded?

A. No. The neutral tap of one of the three transformers in a delta-connected bank must be grounded in all cases where the difference in potential exceeds 150 but does not exceed 3,000 volts. See Electrical Safety Order 704-2 (d).

Concealed Lighting Installed in Home.—J. E. Oust, Jr., electragerist of Merced, Calif., has completed an all-electric home in that city for E. M. Baker, in which the general lighting is secured from concealed sources located in alcoves. Included in electrical equipment in the home is a Hotpoint range and water heater, and six Mag-naray air heaters of the flush type, ranging from 3 to 6-kw. capacity each.

Beverly Hills Requires Bond From Electrical Contractors.—A new electrical ordinance became effective in Beverly Hills, Calif., on Jan 1, 1926. It is patterned after the ordinance now effective in the city of Los Angeles and will require each contractor to deposit \$100 registration fee and give a surety bond in the amount of \$1,000.

Co-operative Advertising Is Used by Electragists

Electragists in southern California are using co-operative advertising campaigns as a means of selling the electragist idea to architects, builders and owners. These campaigns are being conducted by a number of local groups of electragists including San Diego, Pasadena, Glendale, Burbank, Compton and Beverly Hills.

Most of this advertising is appearing on the builders' pages of the local newspapers; some of the groups are using one and others two mediums. The electragist trade mark is featured prominently in all the advertisements, and many of them carry the explanatory clause, "The word Electragist, meaning 'a leader in the electrical contractor-dealer business' is registered as a trade mark by our association, and only members can use it."

The advertising calls attention to the high standards practiced by electragists and assures the reader that

a safe and satisfactory installation will be made by them. The names of the electragists in the local district are listed at the bottom of the advertisements as the firms authorized to use the electragist trade mark.



Hotplate on which meal is cooked for subnormal children at San Rafael grammar school.

School Serves to Subnormal Children Meal Which is Cooked on an Electric Hotplate.—One hot meal a day is served to the youngsters in a class of

subnormal children attending the San Rafael grammar school. Most of them are undernourished and this meal aids in their development. It is cooked by the teacher of the class on a 3,800-watt 3-burner Hotpoint hotplate installed in the teachers' rest room. An electric water heater is also in the room. The electrical installation was made by H. R. Eklund's Electrical Works, electragists of San Rafael.

Underwriters' Laboratories Publish Review of 1925 Activities.—The Underwriters' Laboratories have issued a report of their activities during 1925 covering all departments. The electrical department had a substantial increase in the volume of work handled, more than 1,000 applications covering a wide range of appliances and materials having been received. The electrical test work done at the San Francisco office measurably increased, reflecting the growth of electrical manufacturing on the Pacific Coast.

The word Electragist, meaning "a leader in the electrical contractor-dealer business," is registered as a trademark by our Association, and only members can use it.

Safety and Satisfaction



You are absolutely assured of safety and satisfaction when you patronize an Electragist, whether for wiring or merchandise.

Knowing full well that service supercedes price he builds his business "up to a standard, not down to a price." High business standards make him dependable.

J. B. MORGAN THE McNALLY CO.
BARNES BROTHERS R. H. McCORMICK
ACME ELECTRICAL CO. WEBB & LUKENS
(ELECTRAGISTS)

The ELECTRAGIST MOVEMENT Is Proving to be just what the public has so long desired—



An absolutely dependable body of electrical contractors, protecting the builder against inferior and unsafe electrical work. By dealing with any of the firms listed below, you are assured of SAFETY and SERVICE.

333-54	J. F. ZWIENER,	1224 Third St.
	CALIFORNIA ELECTRIC WORKS,	
Main 272;	357-32	420 Eighth St.
366-20	C. C. CLARDY,	1015-1017 Market St.
	E. R. DAMARUS,	3444 Granada St.
Hilfest 3435-W	INDEPENDENT ELECTRICAL CO.,	828 Seventh St.
354-12	MAYER & BOYCE,	644 Seventh St.
Main 1858	O. W. KARL,	2188 Logan Ave.
Main 6491	SMITH & DODGE,	4670 Oregon St.
Hilfest 6206	SOUTHERN ELECTRICAL CO.,	866 Third St.
Main 4730		

Our New Word

—The word Electragist, meaning "a leader in the electrical contractor-dealer business," is registered as a trademark by our association and only members can use it.



The Electragist Practices High Standards

Whenever you deal with an Electragist you get a square deal. You can be sure of that. An Electragist knows the electrical contractor-dealer business. He knows his costs; his overhead; his turnover; and his customers get the benefit.

These are the reasons an Electragist can practice high standards. And he does this because he knows that maximum profit results to himself as well as to the customer only by so doing.

You can depend on our high practice standards in wiring or merchandising

J. B. MORGAN THE McNALLY CO.
BARNES BROTHERS R. H. McCORMICK
ACME ELECTRICAL CO. WEBB & LUKENS
ELECTRAGISTS

ARCHITECTS AND BUILDERS



Like to have this sign on their buildings. It signifies that the electrical work is HIGH GRADE; done by a RESPONSIBLE CONTRACTOR and safe from fire because NO SHODDY MATERIAL IS USED. The following firms are entitled to use the above trade-mark.

SOUTHERN ELECTRICAL CO.	
Main 1730	866 Third St.
J. F. ZWIENER	
333-51	1224 Third St.
CALIFORNIA ELECTRIC WORKS	
Main 272;	357-32
366-20	1015-1017 Market St.
Hilfest 3435-W	3444 Granada St.
INDEPENDENT ELECTRICAL CO.	
354-12	828 Seventh St.
Main 1858	644 Seventh St.
Main 6491	2188 Logan Ave.
Hilfest 6206	4670 Oregon St.

The word Electragist, meaning "a leader in the electrical contractor-dealer business," is registered as a trademark by our association, and only members can use it.

Built Up to a Standard

Not Down to a Price

Generally when you buy anything you get what you pay for. When you buy from an Electragist you get more than service or merchandise alone, you get the benefit of his knowledge and training that qualifies him as a leader in the field.

An Electragist feels proud that more is expected of him—he knows his higher business standards assure better service and greater value to the customer—moreover he derives a reasonable profit, which is fair.

Play Safe, Consult an Electragist

J. B. MORGAN THE McNALLY CO.
BARNES BROTHERS R. H. McCORMICK
ACME ELECTRICAL CO. WEBB & LUKENS
(ELECTRAGISTS)

PROTECTION

Is a word that means much, and we assure you that it carries its full meaning when applied to the Electragist. The Electragist protects you in electrical transactions. You are assured of safety, service and satisfaction in all service—wiring or merchandising.

You protect your home for safety—you protect your family because you love them—you should protect your electrical work and

Consult an Electragist

He is dependable and trustworthy and has your best interests at heart in his work.



Acme Electric Co. J. B. Morgan
Barnes Brothers Webb & Lukens
R. H. McCormick The McNally Co.

The word Electragist, meaning "a leader in the electrical contractor-dealer business," is registered as a trademark by our Association, and only members can use it.

NEWS OF THE INDUSTRY

Three Portland Utility Companies to Have New Building

A new building to house the general offices of the Pacific Power & Light Company, the Northwestern Electric Company and the Portland Gas & Coke Company, Portland, will rise within the next two years. This announcement was made by Guy W. Talbot, president of those companies, following the recent purchase by him and other interests of a 200-ft. block in the downtown district. The property is bounded by Fifth, Taylor, Sixth and Salmon Streets, and the consideration paid was \$550,000. The interests represented by Mr. Talbot will retain the west half of the block facing Sixth Street, while the other interests involved have acquired the other half.

Initial plans for buildings for the use of the utility companies call for a twelve-story, \$1,000,000, steel and concrete building on the northwest quarter of the block, and two stories of a building ultimately to be twelve stories high on the southwest quarter. The three utility companies will use all of the small building and nine stories of the high building until their growth necessitates their expanding into the other three floors. Further expansion can be taken care of by completion of the south half of the building. The ground floor of both buildings will be designed to accommodate customers paying bills, and to house the merchandise display and stores of the Northwestern Electric Company and Portland Gas & Coke Company.

Leases of the Pacific Power & Light Company and Portland Gas & Coke Company in the Gasco Building expire in about two years, as does the lease of the Northwestern Electric Company in the Pittock Block. Hence it is announced that the new building will be ready for occupancy before that time, and tentatively, that it will be commenced next fall. The name of the building is to be the Public Service Building.

Awarding of Mayfield Site Ends Cowlitz River Dispute

A large development in electrical power and industrial activities to be started in the next few months is forecast by the announcement of R. K. Tiffany, Washington state hydraulics supervisor, that the Mayfield site, on the much-contested Cowlitz River filings, had been awarded to C. C. Garland of Tacoma, representing the Backus-Brooks Corporation of Minneapolis, which will proceed at once with the construction of paper pulp and insulite mills. Reservoir rights and the appropriation of 3,500 sec.-ft. of water from the Cowlitz River go with the permit just issued.

The Cowlitz water rights dispute has been in progress for nearly four

months, and the numerous cases have been under the advisement of the hydraulics supervisor for about two months, following a hotly contested hearing. Mr. Garland's victory automatically brings defeat for H. W. Crozier of Chehalis, who had filed for water rights on sites conflicting with those of Mr. Garland, who was favored, according to Mr. Tiffany, through priority of filing and through the announced assurances of his backers that the development work would be completed more rapidly and be of infinitely greater value to the state (*Journal of Electricity*, Nov. 15, 1925, p. 391).

G. R. Birkelund, Seattle representative of the Backus-Brooks Corporation, in a letter to the hydraulics supervisor, states that the paper mill and insulite plant will have a daily capacity of about 250 tons and that the latter plant will use mill waste or hogged fuel.

The electrical power end of the project will cost approximately \$8,500,000.

Permit also was granted the Cascade Electric Company to divert 1,000 sec.-ft. of water at the mouth of the Cispus River, the water to be carried by conduit $4\frac{1}{2}$ miles, being returned just below the Big Bend of the Cowlitz River. The contemplated development is far enough up the river from the Mayfield site so that it will not interfere with the Backus-Brooks project, the water diverted to be returned above the point where it is needed by that development. The Cascade company was formed by Henry L. Gray, engineer of Seattle, and E. M. Chandler of Olympia, Wash.

Illumination Design Course Date Set by Edison Lamp Works

The Edison Lamp Works will hold its third mid-winter course in illumination, design and sales methods at the Edison Lighting Institute, Harrison, N. J., Feb. 15-20, 1926.

This course is planned primarily for sales and service men of electric service companies. Those who attend will be given a thorough background in illuminating engineering and its application, which will include lectures on special methods which have been found successful in selling lighting installations.

The course of instruction offers to electric service companies an excellent opportunity for training men in illuminating engineering, present lighting practice and the commercial aspects of the lamp business.

All communications regarding reservations, details of the conference and similar data should be addressed to T. F. Joyce, Edison Lamp Works of General Electric Company, Harrison, N. J.

Spokane Company Voluntarily Reduces its Rates

Widespread rate reductions supplying a blanket rate for all towns on the system of The Washington Water Power Company outside of Spokane and revising rates within Spokane and the Spokane Valley district were filed with the Washington and Idaho state officials on Jan. 8.

A new Spokane rate of $5\frac{1}{2}$ cents for the first 32 kw.-hr. and 3 cents for additional kilowatt-hours on residential accounts replaced the former rate of 7 cents for the first 20 kw.-hr. and 3 cents for additional kilowatt-hours. The minimum of 70 cents per month remains. New commercial lighting rates granting reductions also are given within Spokane.

All new schedules become effective on readings after Feb. 20, 1926. The changes filed voluntarily mean an estimated reduction in revenue of more than \$200,000 a year, D. L. Huntington, president, announced.

The most important change is in the 52 cities and towns outside of Spokane served directly by the company, as a large number of widely varied rates now are replaced by new tariffs covering residential, commercial lighting, irrigation and general power service.

Lower irrigation rates are provided in Washington, with an optional rate, new in this pumping district, being provided to care for the small tract owner who needs to develop his land and orchards initially but who does not require continuous service.

New Substations Feature Full Automatic Reclosure

Two more distribution substations recently were placed in service by the Southern California Edison Company. Each of these has full automatic reclosing equipment on the 4-kv. feeders.

South Pasadena and San Marino are served by one of these stations, Garfield substation. This station has 3,000-kva. capacity at 4 kv. and also has facilities for serving the City of Pasadena and the Pacific Electric Railway at 15 kv. when necessary. Three separately regulated 4-kv. circuits and one unregulated double-schedule street-lighting circuit comprise the initial installation.

Covina substation, the second of these two stations, is one of the "residence" type, built of brick and has a high lattice fence concealing the outdoor high voltage equipment. This station has a capacity of 1,500 kva. at 4 kv. and supplies the company's distribution system in and around the city of Covina at that voltage. The initial installation comprises three commercial and one street-light circuit feeding from a regulated bus.

Threaten Moffat Tunnel Suit If Lower Colorado Basin Development Balked by North

Continuing to hold the spotlight, the Colorado River situation brought forth a number of new angles, compromises, and schemes during the past fortnight that would indicate that settlement of its many problems is still in the indefinite future. The Imperial Irrigation District through its attorney, Charles L. Childers, who is now in Washington, has announced its intention to protest against the city of Denver using the Moffat tunnel to take water from the upper Colorado River basin. The new Swing-Johnson bill is claimed to be unlike the proposal of Secretary of the Interior Work for Colorado development on enough points to require a new bill or a compromise. The Norris and Pittman resolutions for the removal of the Colorado, as well as the Tennessee and Columbia Rivers from Federal Power Commission jurisdiction, seemingly has hit a snag in the House. And meanwhile the city of Los Angeles is proceeding calmly to start work on its aqueduct and infiltration canal to the Colorado River, preliminary work having been done on roads and surveys.

Mr. Childers, who is said by news dispatches to be in Washington on behalf of the Swing-Johnson bill, has announced his intention of filing a suit to enjoin the State of Colorado from using the Moffat water-diversion tunnel in diverting water from the Colorado River basin into that of the Missouri River for irrigation and domestic purposes, claiming that the water diverted, sufficient to irrigate 250,000 acres, jeopardizes the water supply of Imperial Valley upon which prior rights are claimed.

The action is contemplated, it was stated, because Colorado and other upper basin states have held that they would oppose any major construction in the lower Colorado River pending unconditional ratification of a seven-state compact. California's ratification of the pact was made with conditional provisions. The move for such an injunction suit is looked upon with grave concern, it is said, by those who wish to bring about an amicable understanding and agreement between all parties. It is felt by them to threaten good feeling and invite a "series of ill-tempered reprisals between sections and municipalities whose mutual welfare depends upon co-operation and good understanding."

The administration has outlined its Colorado River policy in a report made by the Secretary of the Interior on the Swing-Johnson bill. The report was made, it is understood, after Secretaries Work and Hoover had discussed the matter at length with the President.

The report recommends the construction, with federal funds, of a dam in the Colorado River to be 550 ft. high that will create a reservoir of 26,000,000 acre-ft. capacity. The All-American canal, connecting the Colorado River with the Imperial and Coachella Valleys, is held to be an essential part of the plan.

The electrical energy which will be developed in connection with the project should be sold, the report says, at the switchboard to the highest bidder. The purchasers of the power will be in entire charge of distribution, and they

must provide their own transmission lines. A unified power plant, Dr. Work contends, is better than the allocation of power privileges as proposed in the Swing-Johnson bill. Joint use of trunk transmission lines, it is pointed out, is no longer an experiment. The benefits of the development under the administration plan are to be available only to the states that ratify the Colorado River compact.

Consideration of the Swing-Johnson bill and the Colorado River report of Secretary Work was to be undertaken at once by the Senate committee on irrigation and reclamation. It was felt in some circles that, although the Work plan and the Swing-Johnson bill were similar in some respects, the wide differences in the matter of ratification of the six-state pact, modification of and financing of the All-American canal, and other phases of the development, would prevent either proposal from getting approval. A third plan, combining the two, was spoken of as a possibility in this event.

Meanwhile announcement comes in news dispatches that the Municipal Water Bureau of the city of Los Angeles will start work on the Colorado River aqueduct which is to bring water 260 miles to southern California. Bids are to be opened Feb. 1 on a contract calling for the dredging of a large infiltration canal which will parallel the Colorado for a distance of about a mile and a half, and from which the water, seeping through the gravel and sand, will be taken into the aqueduct to supply Los Angeles. This project is to be started in the vicinity of Blythe, it is reported.

Approval of the report of Secretary Work to the Senate committee recommending the construction of a dam on the Colorado River by the federal government was expressed by the city council of Los Angeles Jan. 19, 1926. As a further evidence of its approval the council pledged itself to bring before the voters at the next election the question of a bond issue for the building of a transmission line from the Colorado River to Los Angeles for the purpose of transmitting power from any plants which may be constructed on the river. Councilman Charles Randall, who presented the resolution, explained that the purpose of his action at this early date was to make it clear to Congress that Los Angeles is ready to buy a portion of the power which may be for sale after the completion of the Colorado River dam project.

Index for Vol. 55, Journal of Electricity, Ready for Distribution.—An index for Vol. 55 of the Journal of Electricity, covering issues from July 1 to Dec. 15, 1925, inclusive, is now ready for distribution. Copies may be obtained upon request to the Journal of Electricity, 883 Mission Street, San Francisco.

Whatcom County Power Company to Construct Distribution Line.—The Whatcom County Power Company, Bellingham, Wash., plans to construct immediately a 6-mile, 6.6-kv. distribution line along the Pleasant Valley Road at a cost of \$9,500.

Expert Appointed to Deal With Rural Electric Problems

Tackling the problem of rural electrification in western Washington in earnest, Henry J. Gille, general sales manager of the Puget Sound Power & Light Company, Seattle, has announced the engagement of John C. Scott, a graduate of the department of animal husbandry of Washington State College, for the purpose of co-operating with farmers, horticulturists, poultrymen and other country residents of the territory served toward the solution of problems involving the



JOHN C. SCOTT

use of electricity. Mr. Scott, it was announced, is the first expert to be employed by any private company in the Northwest for this purpose only.

Especially qualified for his position, it is believed that the service Mr. Scott can render by suggestions and advice will prove invaluable to rural residents of the company territory. Graduating in 1916, with a wealth of experience in the management of large stock and hay ranches in Idaho already behind him, Mr. Scott secured a position with the United States Department of Agriculture and later served as county agriculturist of Franklin County. For the past four years he has been manager of the State Reclamation Service at White Bluffs, Wash., gaining at first-hand experience of the problems attached to irrigation. He also has made a particular study of the application of electricity to the poultry business.

Mr. Scott's headquarters will be in the company offices in Seattle, but it is his intention to visit every part of the company's territory and to give first-hand attention to each individual problem that may be brought to his notice. Data so gathered also will be available for the state committee of twenty-one appointed at Pullman College some time ago to study rural electrification throughout the state.

Oakville, Wash., Votes to Dispose of its Light and Power Plant.—After several months of negotiation and discussion, the city council of Oakville, Wash., has voted to dispose of its present light and power plant and has entered into a tentative agreement with T. E. Donaldson of Elma, Wash., to take over and operate the system under an ordinance franchise until such time as final disposition can be made legal by vote of the people. Mr. Donaldson plans to rebuild the entire distribution system and make other improvements. He took over operation of the plant on Jan. 1.

P. P. & L. Co. Expands in Eastern Oregon and Western Idaho

Three power properties in eastern and central Oregon and western Idaho have passed to the control of the interests allied with the Pacific Power & Light Company, Portland, and will be operated by that company, according to announcement by Guy W. Talbot, president. These properties are the Deschutes Power Company, Prineville, Ore., the Enterprise Electric Company, Enterprise, Ore., and the Grangeville Electric Light & Power Company, Grangeville, Idaho, all formerly owned by interests headed by W. C. Sivyver, maintaining executive offices in Spokane. The stated consideration was \$1,850,000, and the sale is subject to approval by the stockholders. The Inland Power & Light Company, now owning several units operated by the companies of which Mr. Talbot is president, will acquire title to the purchased properties.

Coincident with the announcement of the purchase are announced plans for tying in two of the properties with existing properties of the Inland Power & Light Company. The Deschutes Power Company's system will be connected with the Bend Water, Light & Power Company, Bend, Ore., by a 22-kv. line from Culver to Bend, a distance of about thirty-five miles, and a similar line eighteen to twenty miles long from Reubens to Lapwai, Idaho, will connect the Grangeville system to the recently acquired Lewiston, Idaho, property, now connected to the Pacific company's Yakima-Walla Walla system.

The Deschutes Power Company, serving Prineville, Redmond, Culver, Madras and other central Oregon communities, has its principal source of generation on the Crooked River at Cove. The plant contains two units totaling 1,200-kw. capacity. The towns are connected by about eighty miles of 22-kv. transmission line. The Enterprise Electric Company serves Joseph, Enterprise, Lostine and Wallowa, Ore., and receives power primarily from an 800-kw. plant at Wallowa Falls, on the river of that name. Some thirty miles of 11-kv. transmission line connect the communities served. The Idaho property consists of two hydro-electric plants, one on the south fork of the Clearwater River and one on Lolo Creek, and a small steam plant at Orofino, with 22-kv. connecting lines extending between Grangeville on the south and Orofino on the north, with branches east to Kamiah and west to Reubens. Other communities served are Craigmont, Nez Perce, Ferdinand and Cottonwood.

A New Electric Refrigerator Company Formed

The Couzens Ice Machine Company is the name of a newly formed electric refrigerator corporation in Michigan with a nominal capitalization of \$1,000,000, the stock of which is held almost exclusively by United States Senator James Couzens, who announced the organization of the new concern. Officers of the company are: president and executive head—James Couzens; vice-president and treasurer—Frank Couzens, who is the senator's son; secretary—Clarence E. Wilcox. James A. Martin and Ross Schram, formerly associated with Senator Couzens in other

enterprises, also will be connected with the new company. The formation of this company marks the return of Senator Couzens, formerly with the Ford Motor Company, to the industrial world after an absence of ten years.

In commenting upon the type of refrigerator to be built by the new concern, Senator Couzens stated it would be suited for mass production, extremely simple and placed upon the market complete with box for less than half the price of the machines sold today. "We have made a very exhaustive investigation and have reached the conclusion that one of three machines can be produced along these lines," said the senator.

Seattle Manufacturer Occupies New Shop Building

Outgrowing the cramped quarters which the concern has occupied since 1909, the Electric Heating & Manufacturing Company of Seattle completed and moved into its new factory building last fall. The new structure is located at Sixth North and Harrison Streets. It is of steel and concrete and provides three floors of office and factory space.

The company recently established an agent in Florida, besides the two representatives previously established in Los Angeles and San Francisco. It manufactures electric air heaters, water heaters, glue pots, chocolate tables and heavy-duty air heaters.



New three-story factory and office building of the Electric Heating & Manufacturing Company of Seattle.

Pacific Power to Build New Line to Prospect Point

The Pacific Power & Light Company of Walla Walla, Wash., plans to spend between \$65,000 and \$70,000 during 1926 in improvements to the company's service in Walla Walla and adjacent localities, according to R. P. Bragg, district manager. A new high-power line to Prospect Point district to cost \$28,000 is the principal item. Others include replacement of the Sixth Street feeder, a new gas bench and new transmission lines.

The company's 1925 program, just completed, cost more than \$100,000. The last work is that on the Walla Walla River where improvements costing \$12,000 were made.

Seattle Awards Electric Range Contract.—The Board of Public Works, Seattle, has awarded contract to the Pacific States Electric Company for furnishing thirty electric ranges for the municipal light department, on a price of \$2,282. Hot point ranges were specified.

Seattle Plans for Additional Development of Skagit

Mayor E. J. Brown, of Seattle, has signed an ordinance authorizing J. D. Blackwell, city engineer, and J. D. Ross, superintendent of the light department, to apply to the United States Department of Agriculture for a permit for additional development of electric power on the Skagit River.

A permit from the city for development at Ruby Creek already is before the department. Since this application was made, however, the Skagit engineering commission recommended that a dam and power plant be built at Diablo Canyon. The measure signed by the mayor extends the application to include development at the canyon.

The city of Seattle recently filed application with R. K. Tiffany, state supervisor of hydraulics, for water and reservoir rights on an \$11,000,000 expansion of the Skagit River power project in eastern Whatcom County.

The expansion is planned to be undertaken not later than Jan. 1, 1928, and when completed will generate a total of 120,000 hp. in utilizing a 300-ft. fall to the power plant proposed at Diablo Canyon. Work of completing the development will require three years, it is estimated. The reservoir needed will have a dam of concrete construction 350 ft. high. The water will submerge 700 acres of ground to a depth of from 100 to 320 ft. in the storage of 90,000 acre-ft. Seven steel headgates will be required. The city also seeks a further appropriation of 3,500 sec.-ft. of water from the Skagit River and all of its tributaries beyond Diablo Canyon in eastern Whatcom County.

L. A. Gas & Electric Issues New Employee House Organ

Announcing the creation of a new department, namely the public relations department, a new four-page house organ designed for employee circulation was started Nov. 1 by the Los Angeles Gas and Electric Corporation. The name of the publication is "Overhead and Underground."

The L. A. Gas Monthly, formerly the only house publication issued by this company, is to be confined to more formal exposition of construction and operation methods and policy material, and under a new name is to appear quarterly instead of monthly as formerly, it was announced in the new publication. The new paper itself is to be issued twice monthly, and is to be mailed to employees' homes. C. F. Stanley is the editor.

Announcement of the formation of the public relations department in the first issue states that this department will be a consolidation, under one head, of the public relations features formerly assumed by several departments. The offices of manager of public relations, advertising agent, superintendent of employees, and of the special agent, insofar as the latter office deals with public relations, are to be consolidated under the new department. Employee relations and public relations thus will be brought under one head, including personnel work.

D. L. Scott, formerly advertising agent, has been appointed public relations manager in charge of this department.

Commission Issues Permit for Project Near Portland

To permit of the ultimate development of about 100,000 hp. on the Zig Zag, Salmon and Sandy Rivers in Clackamas County, Ore., the Federal Power Commission has granted a preliminary permit for two years to the Oregon-California Hydroelectric Company, Portland. Using the water of these rivers diverted into a common storage of 46,000 acre-ft., behind a dam 145 ft. high, the project contemplates development by successive units, the first of which is estimated at a capacity of 60,000 hp. This is to be located near Marmot about twenty-eight miles east of Portland. Four other smaller units, utilizing the same flow, are projected at present. Final plans have not been announced as the preliminary engineering work has not yet been completed.

The Oregon-California Hydroelectric Company is headed by Sam Connell, Portland, president. Herman Kolberg, San Francisco, is general manager, and S. B. Vincent, Portland, is secretary-treasurer. It is said that arrangements for the financing of the project have been made and that construction will be commenced soon if reports of engineers are found to be satisfactory.

New Building for L.A. Gas and Electric Company Shops

The Los Angeles Gas and Electric Corporation is to start work immediately on the construction of a three-story building for the use of the electric distribution department. The building, which will occupy a site between Pico and Fourteenth and Wall and Myrtle Streets, will have a total floor space of approximately 60,000 sq. ft. It will house the offices of the department, the electric meter-testing laboratory, the transformer-testing laboratory, the electric meter-repair shop, and a branch of the corporation's store-room which will handle all except the largest and heaviest electrical supplies.

Ample provision has been made to care for the comfort and welfare of the thousand employees of the department. A large and well equipped locker and washroom and an assembly hall are the chief features of this nature. In addition, the new location will provide garage and yard space for the 100 or more cars and trucks used in the corporation's electric distribution service.

The cost of the new building and yard will total about \$400,000, and they are expected to be ready for occupancy by the middle of February, 1926.

Feather River Company Awards Buck's Creek Contract

Contract has been awarded by the Feather River Power Company of San Francisco to R. C. Storrie & Company for the construction of its Buck's Creek hydroelectric power project on the North Fork of the Feather River. (Journal of Electricity, Oct. 15, p. 306.)

The contractors are to supply all materials, equipment and labor and construct the entire project for \$7,691,889. The plant is to be completed by Dec. 31, 1927.

News Briefs

Salt Lake City Chamber of Commerce Joins Colorado River League.—The Chamber of Commerce of Salt Lake City officially has become a member of the Colorado River League, along with similar bodies in the other upper basin states, Colorado, Wyoming and New Mexico, and will enter into the fight to obtain the ratification of the Colorado River compact. The Salt Lake chamber had a special representative present at the senatorial committee meeting held in Los Angeles Oct. 26, for the purpose of discussing different problems relative to the development of the hydroelectric resources of the Colorado River.

Acquire System in Colorado.—Breckenridge, Colo., has been added to the system of the Public Service Company of Colorado in the recent purchase by that company of the distribution system of the Tonopah Placers Company. This placer mining company heretofore has purchased power from the Public Service Company for its own requirements and those of other Breckenridge residents. No change in policy or personnel has been made by the purchasing company.

Northwest Electric Light & Power Association

Technical Section Committees Studying Many Subjects

At a meeting of the executive committee of the Technical Section in Spokane recently progress in the work of a number of the subcommittees was reported. In general the section is studying problems of particular interest to Northwest utility companies, though many of the forthcoming reports will have a significance not confined to this geographic division.

The accident prevention committee is looking into possible means of abating the hay-derrick hazard, the tree-trimming hazard and the radio-aerial hazard.

The prime movers committee is making a study of the methods of handling hogged fuel, with a view to finding a cheaper way to unload from a barge to a receiving dock.

The overhead systems committee is continuing its investigation of the life of treated and untreated poles, commenced last year.

The hydraulic power committee is studying the economic design of hydroelectric plants, taking into consideration load conditions and the other plants on the system in the hope of being able to define certain standards that might be used in laying out a system in which hydroelectric plants form the major source of generation.

The meter committee is determining

Los Angeles Installed 203 Miles of Ornamental Street Lighting in 1925.—During 1925 there were 203 miles of ornamental street lighting systems completed in Los Angeles, according to a report by Frank L. Shaw, chairman of the city council committee on traffic and lighting. In 1924 84 miles of lights were installed. Twenty-seven contracts which have been let but not completed at the present time call for 21 miles more. Sixty-five contracts calling for 76 miles of lights are under consideration, while it is estimated that approximately 500 petitions are being circulated which will result in an additional 200 miles of lights. The number of posts installed to date is 15,709. The total value of the systems installed in 1925 was \$2,540,942.

Seattle City Light Department Establishes New Store.—The City Light Department, Seattle, Wash., has established a new store at 4506 University Way for the accommodation of its customers in the University district, Seattle's largest suburb. A complete line of electrical appliances will be carried.

Utah Utility to Wholesale to Idaho Town.—The town of Arco, Idaho, county seat of Butte County, has signed a ten-year contract with the Utah Power & Light Company for wholesale electric power. The town owns its distributing system and will distribute the service to its customers at retail.

the losses in instrument transformers under varying conditions.

The underground systems committee is working out a standard design of manholes and arrangement of equipment. It also is studying the different methods of locating cable faults.

The inductive co-ordination committee is continuing its study of the causes of radio interference.

Some of these subjects will be discussed at the third annual general meeting of the section in Seattle, March 11 and 12, 1926.

Northwest Engineers to Attend Technical Meeting.—At the meeting of the executive committee of the Technical Section in Spokane in January the following were chosen as delegates to the group meeting of the Technical National Section in Kansas City, Mo.: R. R. Robley, operating engineer, Portland Electric Power Company, Portland; J. B. Fisk, consulting engineer, The Washington Water Power Company, Spokane; and Z. E. Merrill, assistant general manager, Mountain States Power Company, Albany, Ore. At the same time the following alternates were chosen: G. E. Quinan, chief electrical engineer, Puget Sound Power & Light Company, Seattle; E. F. Pearson, electrical engineer, Northwestern Electric Company, Portland; and R. E. Thatcher, superintendent of service, Central District, Puget Sound Power & Light Company, Seattle.

Pacific Coast Electrical Association

Technical Conclave at San Francisco Provides Busy Time for All

As usual the conclave of the Technical Section was a beehive of activity. The meetings were held at the Fairmont Hotel in San Francisco, and every minute of the three-day session was utilized to advantage by the nine regular committees of the section in the furtherance of their work. In fact constant driving on the parts of the various chairmen was necessary in order to get through the work on hand.

Widespread discussion of the many reports submitted gave a true indication of the genuine interest of all in attendance at the meetings. R. R. Cowles, Pacific Gas and Electric Company, general chairman, sounded the keynote of the sessions in demanding "business first" throughout the three days of meetings.

All committees have their work well in hand, and in several cases portions of it are completed already and will be presented shortly in the form of serial reports. The change in plan to provide that serial reports should be issued upon completion of a designated portion of a committee's work instead of holding all reports until convention time was adopted about a year ago. However, the benefits of the new plan only are beginning to be felt. The serial report plan, together with the vice-chairman plan which was adopted last spring, will do much to further the continuity of the work of the section. This is obvious even at this early date. The plan permits of the acceptance of new subjects for study as these new subjects develop instead of holding them over until the beginning of a new fiscal year. Chairman Cowles urges the full use of serial reports by all committees.

Two general meetings each drew a large attendance. The first of these was a luncheon meeting held at noon Thursday, Jan. 14. Each of the committee chairmen who attended the Detroit meetings of the Technical National Section gave a brief outline of the activities at those meetings. L. S. Ready, chief engineer of the California Railroad Commission, was the principal speaker at this meeting. He outlined some of the many differences in utility operation under conditions of competition and under the present condition of regulation. Candor featured the speaker's discussion in which he weighed each condition in the balances. Stating that while from the viewpoint of the consumer, there are some possible benefits to accrue from competition there are more benefits to all concerned to be realized under regulation. Some of these latter are standardization of construction, standardization of equipment, standardization of service, definite plans for future development, and definite plans for continuous improvements. Mr. Ready stressed the fact that free and common interchange of technical and

operating information between and among electrical utilities, as well as with other utilities, was essential to their continued economical operation; and further, that nothing whatever is to be gained by the failure to participate in full interchange of ideas of design and operation or of those making for increased efficiencies.

The second general meeting was held Friday evening. This was a joint dinner meeting with the San Francisco Section of the American Institute of Electrical Engineers. The dinner part of this meeting served admirably as a social feature in conclusion of the series of committee meetings and the technical discussions that followed the dinner served in a similar capacity to wind up the technical features of the sessions. J. A. Koontz, electrical engineer, Great Western Power Company, was the feature speaker, and his subject was "Mechanical Appliances in Line Erection." Mr. Koontz outlined the labor-saving machinery and appliances used by his company in the construction of its new 220-kv. tie line in the San Joaquin valley. Several slides and a reel of moving pictures illustrated Mr. Koontz's talk. Following Mr. Koontz was W. D. Hannun, of the Pacific Gas and Electric Company, and V. W. Dennis and J. S. Gray of the Pacific Telephone & Telegraph Company, who outlined the line-erection apparatus used by their respective companies.

No attempt is made herein to review the detailed activities of the meetings of the various committees. These are set forth in the brief summaries prepared by the committee chairmen that appear in the following paragraphs.

Accident Prevention Committee

J. M. BUSWELL, San Joaquin Light & Power Corporation, Fresno, Chairman.

Extensive and lively discussion of the subjects previously announced for this year's study by the committee marks the two days that the committee was in session. Preliminary reports in most cases were the subjects of the discussions. These reports are to be completed and improved for final presentation. Most of them are expected to be ready for publication in the convention issue of the Journal of Electricity. Others will be discussed further at the Fresno meetings in April and then presented at the convention in June for subsequent publication.

"Tools" and "Safe Practices" were the titles of the two principal papers discussed at the San Francisco meetings. Two subjects assigned by the national committee, "Tree Trimming" and "Identification of Cables," were given considerable attention. Safety in

underground work and in station operation were as prominent in the discussion as was line safety. A most interesting exhibit of safety appliances and equipment was prepared by S. C. Dickinson and C. A. Jordan of the Pacific Gas and Electric Company. This exhibit attracted the attention of the whole technical delegation.

At the Fresno meetings the further discussions, particularly on "Safety Code," "Accident Statistics" and "Safe Pole-Handling Methods" assuredly will be as interesting and valuable as they are important. Another interesting exhibit is to be given there, and a full attendance is urged.

Hydraulic Power Committee

WALTER DREYER, Pacific Gas and Electric Company, San Francisco, Chairman.

R. S. Quick of the Pelton Water Wheel Company, San Francisco, gave a very interesting paper, "Comparisons and Limitations of Various Theories of Water Hammer." In this paper Mr. Quick derived in a simple manner the so-called exact formula for water hammer, the final equation being the same as that used in the theories of Allievi, Durand and Norman Gibson. The approximate formulae of Johnson, Venzano, Warren and A. H. Gibson also were explained, and the limitations of each pointed out. The so-called exact formulae still retain limitations in that no allowance is made for variation in diameter of conduit or for branching pipes and their influence on reflected waves. A general discussion on suggested tests covering these points and on the subject of the degree of reflection obtained with and without the water-wheel units running followed the presentation of the paper. Tests to be made by the Pacific Gas and Electric Company and by the Southern California Edison Company then were described.

A review of various types of relief valves, deflecting nozzles and deflecting hoods was given by E. A. Crellin of the Pacific Gas and Electric Company, San Francisco. Mr. Crellin used a number of slides to illustrate his talk. The apparatus which was described is used in conjunction with long pressure-pipe installations to prevent excessive pressure changes and to afford better speed regulation of the hydraulic units operated on such lines.

An instructive talk was given by J. P. Jollyman, Pacific Gas and Electric Company, San Francisco, on "Vibration in Hydraulic Turbines." In this talk Mr. Jollyman explained the causes and possible dangers of this trouble and the comparatively simple manner of either preventing or eliminating the disturbance. Further indication also was given of the possibilities of the use of the device developed by Roy Wilkins (Pacific Gas and Electric Company, San Francisco,) which combines a pressure element and an oscillograph to measure and record pressure changes of any magnitude and any frequency.

A summary of data on the obstruction of water flow in conduits due to vegetable and animal growths was given in a paper presented by C. De Witt of the Pacific Gas and Electric Company. These growths may cause a heavy reduction in flow capacity of

flumes, canals, pipe lines or other hydraulic conduits. Methods of prevention and removal were discussed generally.

J. M. Gaylord, of the Southern California Edison Company, gave a brief resume of the present status of the experimental work of Mr. Cummings of the California Institute of Technology, Pasadena, on the subject of evaporation losses from reservoirs.

Penstock-design discussions occupied the second day's sessions. New developments in expansion joints and bends, painting experience and practice, experiments on friction losses, and new types of welded and seamless pipes were described. Mr. Jordan's detailed description of the new Balch plant of the San Joaquin Light & Power Corporation was read and aroused much interest. This plant is the first of three "super-head" plants to be constructed.

Meter Committee

R. G. JONES, Southern Sierras Power Company, Riverside, Chairman.

Progress reports were read by each subcommittee chairman, and each was followed by lively discussion. It is assured definitely that the short course for metermen will be held at the University of California in Berkeley during the coming year. Further, it is planned to hold a parallel course in the southern part of the state, if possible. Definite dates cannot be announced at this juncture but will be given later.

Several new developments in the meter and instrument field were presented to the committee and created much interest. Some new and ingenious devices to make testing more safe were exhibited. These exhibits elicited varying comment. It appears as if some tangible headway is being made toward a solution of the test-facility problem. A device that will be approved as to manner and method by the various operating companies seems not remote.

A report of W. R. Frampton, Southern California Edison Company, who represented the meter committee at the Detroit meetings, was read and accepted.

Prime Movers Committee

J. W. ANDREE, Southern California Edison Company, Los Angeles, Chairman.

Reports were read giving the activities of the national prime movers committee at the Detroit and Philadelphia meetings and covering the assignments of work to the local committee. A synopsis of a report on condenser-tube investigation produced by the national committee was presented, and members of the local committee were advised that copies of this report may be obtained by application to the chairman. C. W. Wiggins, San Diego Consolidated Gas and Electric Company, vice-president, gave a preliminary report for his subcommittee on the subject of condenser-tube investigation. A lively discussion followed this report. F. G. Philo, Southern California Edison Company, Long Beach, reported on the methods to be adopted by that company in the installation of the new 50,000-kw. unit in the Long Beach steam plant for overcoming erosion of

condenser tubes at the entrance end. Caustic embrittlement of boilers was discussed at some length. Reference was made to the studies now being made on this subject by the national committee.

C. H. Delaney, Pacific Gas and Electric Company, San Francisco, made a preliminary report for his subcommittee on the burning of liquid and gaseous fuels, presenting tables of data gathered from the operating records of various Pacific Coast companies. Other subjects discussed were the use of floating roofs for fuel-oil tanks, pulsations in furnaces, and furnace temperatures both with gas and with fuel oil.

A joint session was held at which Mr. Philo gave a very interesting illustrated description of the mercury-vapor-turbine installation at Hartford, Conn.

Progress for his subcommittee was reported by C. E. Steinbeck, Pacific Gas and Electric Company, San Francisco, in the matter of power-plant design. Further information and interesting data on water-cooled vs. air-cooled furnace walls are expected to be available for the Fresno meetings.

Heat balance and station auxiliaries were covered in a joint report given by Mr. Philo, who also reported for Mr. Krapf who was unable to attend. A heat-balance diagram for the new Long Beach plant was presented and thoroughly explained. The balance of the session was given over to general discussion in which some of the subjects were evaporators and feed-water treatment; loading, scaling and blowing down boilers; and steam vs. electric drive for plant auxiliaries.

Overhead Systems Committee

G. A. RILEY, Los Angeles Gas & Electric Company, Los Angeles, Chairman.

Satisfactory progress is noted in all branches of the work of the overhead systems committee. Lively discussion at all of the San Francisco sessions evidenced the wide and active interest on the part of those attending.

Preliminary reports on the following subjects were presented:

- Life of Treated and Untreated Poles.
- Testing of High-Voltage Insulators in Service.
- Line Maintenance.
- Line Construction Costs.
- Grounding of Primary and Secondary Lines.
- Distribution Transformer Standardization.

The last two subjects are being studied jointly with the apparatus committee as there is an overlapping in their scope.

No further report on General Order No. 64 was made. The suggestions of last year's committee on that subject were submitted to the California Railroad Commission some time ago and now are under consideration by that body. On the subject of treated and untreated poles it was shown that termites are almost as much of a menace to the life of wood poles in some localities as is decay. This indicates that some method of preservation for the length of pole above ground may be as necessary as for the portion below the surface.

Appreciable saving in costs is reported for outlying districts where

liberal use of hot-line insulator testing and line maintenance has been the vogue. Four divisions have been made in the study of distribution transformer standardization:

Electrical Characteristics of Transformers.

Improvement of Fuse Protective Devices.

Terminals, Lead Wires and Connections.

Standard Voltage Ratios.

Each of these sub-topics is being given separate consideration.

Discussion showed the desirability of the development of a standard gage for the 1-in. and the 1 $\frac{3}{8}$ -in. pin holes in insulators. A suggested measuring device conforming to N.E.L.A. specifications was submitted for the 1-in. hole. A subcommittee was formed to study this gage and also to make recommendations for a 1 $\frac{3}{8}$ -in. standard with a suitable gage.

Safety Rules Committee

W. R. FRAMPTON, Southern California Edison Company, Alhambra, Chairman.

The committee is interested primarily in the furtherance of the Electrical Safety Orders of the State of California and secondarily in other allied matters. This work is tied in closely with the activities of the electrical inspectors, and it is a satisfaction to announce that arrangements have been completed whereby meetings of the Electrical Inspectors Association and the Technical Section will not be held on conflicting dates as heretofore has been the case most of the time.

Opinion was crystallized in favor of new developments in devices suitable for several different methods of testing. Several switch manufacturers' representatives were present with different safety switches which included testing facilities. These switches were shown to the committee. There was general discussion concerning the possibility of adopting uniform regulations regarding test facilities.

Some of the more important features in the Electrical Safety Orders were enlarged upon in a paper presented to the committee. The joint committee on grounding offered preliminary reports for discussion. However, time did not permit the completion of this subject, and the work will be continued for further report at the Fresno meetings in April.

A. I. E. E. News

San Francisco Section. P. J. Ost and N. A. Eckhart of the engineering department of the city of San Francisco, will address the February 26 meeting. Their subject will be the Moccasin Power Development.

Official nomination of H. H. Schoolfield, chief engineer of the Pacific Power & Light Company of Portland, Ore., for vice-president has been announced by Institute headquarters. Mr. Schoolfield will represent the Northwest district in the event of his election.



News of the Electragists



California Electragists Hold Interesting Convention at Catalina

Constructive suggestions for the up-building of the contractor-dealer branch of the industry marked the third quarterly meeting of the California Electragists, Southern Division, which was held at the Hotel St. Catherine, Catalina, Jan. 22-23, 1926.

Better merchandising methods and co-operation with power companies were the keynotes of the meeting of the merchandising section which was held Friday afternoon at 2:30. The report of the merchandising committee was read by C. A. Rowley of The McNally Company, Pasadena, Calif. This report recounted the activities and accomplishments of the committee since the Lebec convention and outlined what the committee proposes to undertake during 1926.

Contact with the Southern California Edison Company has been strengthened, and representatives of this company have been attending all of the regular meetings of the committee in order that frank discussion of merchandising and other problems of mutual interest might be had. This has resulted in special sales plans for six months in advance having been laid, and it is believed that the co-ordination of effort in display of merchandise, in advertising, and sales endeavor will return a maximum of benefit possible from such sales.

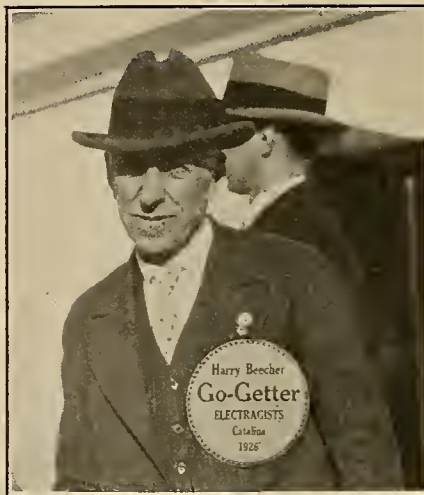
Plans and specifications for several standard range and water-heater installations have been prepared, and the Edison company has announced flat installation charges based on those plans and specifications. This will allow the quoting of prices of ranges installed.

Electrical refrigeration was considered by the committee, and electragists were urged to investigate its merchandising possibilities, although they were cautioned not to rush into it without study.

During 1926 it is hoped to stimulate a keener interest in the monthly specials and a broader contact with central stations throughout the territory. Merchandising clubs are being sponsored by manufacturers and jobbers, and this work was commended by the committee. Advertising is being studied in an effort to tie in individual advertising with sectional and national advertising programs. Electragists will be urged to capitalize the idea that radio is primarily an electrical device. In concluding its report the committee included the following definition of service: "Not something for nothing; but prompt and efficient attention to the needs of your customer at a reasonable price."

The 1926 merchandising program of the Southern California Edison Company was presented by R. I. Carruthers, assistant sales manager of that company. He stated the electragists would be the beneficiaries of the extensive program if they took advantage of

the opportunities which it presents. In speaking of the flat installation charges for range and water heaters according to the uniform plans he said the contractors' overhead would be reduced greatly as the company representative would issue an order to a contractor to install a job at a definite location in accordance with one of the plans. This would eliminate any selling expense on the job, and it would not even be necessary for anyone to see the job in advance of delivery of the material for the installation. After its completion the contractor would make out an invoice to the company and immediately would receive a voucher paying this which would eliminate any collection expense.



Harry Beecher, chief electrical inspector of Los Angeles, was named the "Go-Getter" of the convention for having been the first person to make reservations.

"Domestic Refrigeration in the Electrical Industry" was the subject of a talk by L. B. Williams of Listenwaller & Gough of Los Angeles. He presented some practical sales ideas that could be used by electragists in selling electrical refrigeration, particularly for homes. He stated electrical refrigeration has arrived and that every owner of an automobile or radio has shown that people will buy the things they want.

R. E. Smith, advertising manager of the Southern California Edison Company, addressed the meeting on the subject of advertising for the contractor-dealer. He stated advertising required courage, that it must be concentrated and consistent. Four per cent of the gross volume of the business was the amount recommended for advertising. He advocated that this should be concentrated in newspapers and in only one paper for the dealer doing a yearly volume of \$50,000 or less. Mr. Smith cautioned the mem-

bers relative to the inadvisability of program, congratulatory, and similar advertising. He stated the space should be used in telling a brief, straightforward story. Tie-in advertising with national advertising was urged.

"Store and Window Display" was the subject of an illustrated talk by C. E. Lewis of The Electric Corporation. Practical ideas and methods which could be employed by dealers were shown by Mr. Lewis. He urged the use of hardwood floors or linoleum in the show window and the use of plush or velour in display. Pedestals were recommended for breaking up height levels. Every window display should tell a story and Mr. Lewis gave several examples of what could be done to accomplish this result. Ideas for window displays can be secured from national advertisements, the seasons, holidays and similar sources. Mr. Lewis also touched on the subjects of illumination, display cards, and store arrangement.

This meeting was attended by 156 persons, and O. N. Robertson of the Robertson Electric Company, Santa Ana, Calif., presided.

The members' meeting followed immediately after the close of the merchandising section, and 45 members were present. Harry H. Walker, president of the California Electragists, presided. The report of the executive committee was presented at this time. The plans outlined for the standard range and water-heater installations also were explained in detail.

C. J. (Cy) Geisbush, executive secretary of the association, outlined the accomplishments of the organization since March, 1925. He urged a more active participation in the work of the association by the members.

Harry H. Walker appealed to the individual members to give their financial support to the California Electrical Bureau.

Concurring in the recommendation of the members to the joint executive committee of the state body, the latter committee met and selected Del Monte as the place of holding the annual meeting of both the Northern and Southern Divisions of the California Electragists; the date was tentatively set as some time in August.

The general open meeting was held Saturday morning, at 10:30, President Walker in the chair. The Red Seal plan was discussed by W. F. Brainerd of the California Electrical Bureau. He outlined the history of the plan and the benefits that will accrue to the electrical industry. He also gave a brief outline of the requirements and the method of operation of the plan in California.

W. F. McWhinney, of the Southern California Edison Company, outlined the 1926 program of that company, which includes expenditures totaling \$90,000,000.

J. C. Miller, Pacific Telephone & Telegraph Company, Los Angeles, spoke on the need of specifications for telephone conduits and urged the co-operation of the electragists in bringing this about. He stated engineers of his company will render their service gratis in this work.

G. L. Duffey, of the Southern California Telephone Company, called attention to the importance of adequate

conduits for telephone service to owners, builders, architects and contractors.

Harry Harper, manager Graybar Electric Company, Los Angeles, urged the study of the business guide which had been published by the electrical supply jobbers of Los Angeles. He gave a resume of the work which already had been presented to the convention. He emphasized the work which has been done by C. J. (Cy)

Geisbush for the association and especially in co-ordinating the work of the various committees.

The banquet was held Friday evening and was followed by a dance. Other entertainment provided for the convention included trips in the glass-bottom boats, auto-stage scenic trips, and golf. The party left Los Angeles Friday morning at 9 and returned Saturday afternoon, leaving Catalina at 3:30 p.m.

Electrical Inspectors of Northwest Organize at Meeting in Portland

With 118 members representing all branches of the electrical industry and all districts of the states of Oregon and Washington, the new Northwest Association of Electrical Inspectors was launched successfully at the first annual convention in Portland, Jan. 11-12, 1926. The enrollment exceeded the expectations of the most optimistic of the sponsors and was responsible in part for the spirit of enthusiasm which was in evidence throughout the two-day meeting. An excellent program of papers and discussion tended to heighten this enthusiasm, which found expression toward the end of the last session in the unanimous vote of the convention to accept the invitation of Longview, Wash., to hold next year's meeting in that city.

Officers elected at the first session Monday morning were: president—L. W. Going, chief electrical inspector, Portland; vice-president—W. P. Weathers, chief electrical inspector, Longview; secretary and treasurer—F. D. Weber, electrical engineer, Oregon Insurance Rating Bureau, Portland; and the following additional members of the executive committee—J. H. Sroufe, of the contracting firm of Jaggarsroufe, Portland; J. B. Fisk, consulting engineer, The Washington Water Power Company, Spokane; H. A. Patton, electrical engineer, Washington Surveying and Rating Bureau, Seattle; and H. S. Jenkins, chief electrical inspector, Bellingham, Wash. Two honorary members of the association were elected by the convention, namely: C. W. Mitchell, electrical engineer, Board of Fire Underwriters of the Pacific, and secretary of the California Association of Electrical Inspectors, San Francisco, who brought a message of greeting from that association, and assisted in organization details; and Edward Grenfell, assistant chief of the fire department, and fire marshal of Portland, who addressed the convention on the necessity of co-operation of fire departments with city electrical inspectors.

The afternoon session was opened by a paper on the making of a municipal code, by L. W. Going, in which he discussed the need of such a code to supplement the national code. E. B. Morrison, electrical engineer, Oregon Insurance Rating Bureau, Portland, outlined the changes in the 1925 edition of the national electrical code. The operations of the Underwriters' Laboratories, Inc. were explained by R. J. Larrabee, engineer of that organization, San Francisco. Discussion on these papers, by H. A. Patton, Seattle, F. H. Murphy, illuminating engineer, Portland Electric Power Com-

pany, and W. E. Roberts, deputy electrical inspector, Portland, centered around the inadequacy of the 15-amp. rule in the national code, and the inefficiency of the higher amperage fuses and of the clips and contacts of knife switches when operating at loads approaching their rated capacities. R. E. Thatcher, superintendent of service, central district, Puget Sound Power & Light Company, Seattle, entered a protest against the regulation in the national code in which grounding of meter cases in installations over 150 volts is required, stating that to ground the lower voltage meters created a hazard to meter men not offset by benefit to the public.

Radio interference formed the chief topic of discussion at the Tuesday morning session. W. R. Cornell, test engineer, Portland Electric Power Company, Portland, told what the power companies were doing toward discovering the real causes of interference and removing those for which they were responsible, and how the great volume of interference was caused by small appliances in the houses of customers and other agencies beyond the control of the companies. Ellis Van Atta, radio expert, Pacific Power & Light Company, Walla Walla, Wash., amplified Mr. Cornell's remarks, calling attention particularly to the heating pad as being one of the worst disturbers of radio reception. J. B. Fisk introduced discussion of the hazard created by the indiscriminate erection by unskilled persons of radio aerials in close proximity to power lines.

Opening another subject at this session, E. G. S. Pryor, resident engineer, Underwriters' Laboratories, Inc., Seattle, read a paper entitled, "Duties of Field Secretary of National Fire Protection Association," by W. J. Canada, who holds that position, but who was unable to attend this meeting. Mr. Canada's paper pointed out that, after becoming acquainted with inspection practices at variance with the national code, he attempted to acquaint the code-making committees with these variations and to accelerate committee action where such accelerations seemed necessary. Edward Grenfell's talk followed, and was discussed by J. C. Caine, deputy electrical inspector, Portland, who told how the electrical department of the city co-operated with the fire department inspectors.

A subject eliciting considerable interest at the Tuesday afternoon session was an explanation of the so-called "Dealer's License Law" in the Portland code, by J. C. Caine, to whom was delegated the responsibility for

proper application and enforcement of this part of the code. Under this law every dealer in electrical appliances or equipment is required to have a municipal license to do business, one of the requirements of which is that he shall install, sell or keep in stock for sale only such equipment as has been approved by the National Board of Fire Underwriters.

A spirited discussion followed the presentation of a paper on the effect of grounding electrical circuits to city water systems, by J. B. Downer, city water department, Seattle. Mr. Downer pointed out the danger to water-company employees created by grounding the neutral conductor of electrical circuits to water service pipes, showing by means of charts how such grounds were often inadequate.

Also on the program at this session was C. H. Lum, assistant general manager, National Board of Fire Underwriters of the Pacific, and general agent of the Underwriters' Laboratories, Inc., San Francisco, who presented a paper on electrical inspection. He was followed by Will Moore, state fire marshal and insurance commissioner of Oregon, Salem, who told something of the relation of his office to the work of those responsible for electrical installations. The code from the viewpoint of an electrical contractor was discussed in a paper by V. S. McKenny, NePage, McKenny Company, Seattle, read in his absence by Roy C. Kenney of the Portland branch of that firm.

A resolution recommending revision of the national code to make conduit necessary in wiring school houses, assembly rooms and public meeting places, and one recommending the limiting of wattage allowed on two-wire branch circuits, were passed and referred to the proper committee for action. The convention also went on record, by resolution, as favoring state legislation regulating the erection of radio aerials to eliminate the present existing hazard. Looking to a simplification of state electrical inspection in Oregon, now being conducted by three separate state departments with consequent duplication, a resolution recommending investigation of and report on this situation by the legislative committee was passed.

The banquet Tuesday evening was addressed by George Sawyer, sales manager, Pacific Power & Light Company; C. P. Osborne, superintendent light and power, Portland Electric Power Company; L. T. Merwin, vice-president and general manager, Northwestern Electric Company; George Boring, manager, Pacific States Electric Company; and Roy C. Kenney, manager, NePage, McKenny Company, all of Portland. J. H. Sroufe acted as toastmaster.

Annual Banquet of Contractors Is Well Attended.—Representatives from all branches of the industry attended the sixth annual banquet of the San Francisco Association of Electrical Contractors and Dealers, which was held in the roof garden of the Hotel Whitcomb on Jan. 16. An interesting program of entertainment was provided by the committee. The banquet was attended by 263 persons and was one of the most successful ever sponsored by the San Francisco Association.

Meetings

Rocky Mountain League Elects Officers for 1926

The annual election of officers of the Rocky Mountain Electrical Co-operative League was held at Salt Lake City, Dec. 28, and the following were elected for the year 1926:

President—George R. Randall, president and general manager of the Salt Lake Electric Supply Company, succeeding C. B. Hawley.

Vice-president—B. E. Rowley, manager Salt Lake City branch of Edison Electric Appliance Company, succeeding George R. Randall.

Secretary-treasurer—R. M. Bleak, superintendent of lighting and appliance sales, Utah Power & Light Co.

The following were selected on the board of trustees from the various branches of the industry:

Jobbers—J. A. Kahn, Capital Electric Company; J. M. Perlewitz, Graybar Electric Company; W. J. Berryman, Mine & Smelter Supply Company; H. R. Bygel, United Electric Supply Company.

Contractor-Dealers—George R. Randall, Salt Lake Electric Supply Company; F. C. Wolters, Modern Electric Company; J. V. Buckle, J. V. Buckle Electric Company; G. J. Guiver, Holding Electric Company.

Manufacturers—B. E. Rowley, Edison Electric Appliance Company; W. A. Moser, Westinghouse Electric & Mfg. Company; B. C. J. Wheatlake, General Electric Company; Thad J. Stevens, Stevens Sales Company.

Central Station—D. C. Green, P. M. Parry, H. M. Ferguson and R. M. Bleak, all of the Utah Power & Light Company.

Telephone Company—O. J. Hyde, Mountain States Telephone & Telegraph Company.

Long Beach Electric Club Officers Take Office

At the fifth annual meeting and banquet of the Electric Club of Long Beach, Calif., the newly elected officers for the ensuing year were inducted into office. R. W. Albright, chief electrical inspector of the city of Long Beach, is the new president. James Henderson, first vice-president, is connected with the Marsh Electric Company at Long Beach. Fritz Ziebarth, second vice-president, and C. O. Wheat, sergeant-at-arms, are both electrical contractors. Vern L. Ringle, secretary and treasurer, is chief appliance salesman of the Southern California Edison Company, Long Beach.

Following the banquet, a program interestingly setting forth the progress of the electrical industry was presented by representative electrical men of the community. G. A. Harper and J. J. Riley, of the newly organized Graybar Electric Company; Myron McNeal, district manager, Southern California Edison Company, Montebello; and E. B. Cummings, assistant district manager, Southern California Edison Company, Long Beach, were the principal speakers of the evening.

Salesmen of Capital Electric Company Hold Conference

The annual salesmen's conference of the Capital Electric Company was held at the company's offices at Salt Lake City for three days beginning Dec. 29. In addition to the company's regular salesmen, there were in attendance at the meetings several members of the local organizations of the General Electric Company and Edison Electric Appliance Company, also M. D. Williams representing the General Electric Company's general merchandising department, of Chicago. The meetings were devoted to discussions and exchange of ideas concerning sales activities for the ensuing year.

On the evening of Dec. 29 the annual banquet was held at the Hotel Utah, at which about 75 guests were present, including employees of the Capital Electric Company, General Electric Company, and Edison Electric Appliance Company. Frank B. Cook, president of the Columbia Trust Company,

Mr. Quinan spoke on "Power Facilities and Growth."

Other addresses scheduled for early date include "Electric Rates," by H. J. Gille, general sales manager; "Transmission and Distribution," by M. T. Crawford, superintendent of distribution, and "Public Relations," by N. W. Brockett.

Electrical Refrigeration Topic of Electric Club Meeting

Electric refrigeration was the topic of the day for the Los Angeles Electric Club meeting of Jan. 11. Arthur Spring, district manager of the Servel Corporation, acting as chairman of the day, introduced his competitors one by one and allowed them to tell their stories but refused to give away any of his own trade secrets. Donald De Fremery, mechanical engineer for the Union Ice & Cold Storage Company of Los Angeles, made an excellent speech, covering the principles of refrigeration.

The rest of the program follows:

History of Domestic Electric Refrigeration—F. L. Pollard, vice-president and general manager, Heesman Pollard company, distributors of Servel; Food Preservation—L. B. Williams, sales engineer, Listenwaller & Gough, distributors of Copeland; Convenience—D. D. McFarlane, sales manager, Newbery Electric Corporation, distributors of Electro-Kold; Central Station Benefits—J. H. Cunningham, manager central station department, General Electric Company, General Electric; Servicing—George Ratterman, sales manager, Delco Light Company, Frigidaire; Merchandising and Future—L. D. Robertson, Pacific Coast sales manager, Kelvinator Corporation, Kelvinator.

COMING EVENTS

National Association of Railroad and Utilities Commissioners—

Kansas City, Baltimore Hotel
Feb. 9-12, 1926

American Institute of Electrical Engineers—
Midwinter Convention in New York

Feb. 8-12, 1926

Technical Section, Northwest Electric Light and Power Association—

Annual General Meeting—Seattle, Wash.
March 11-12, 1926

Electrical Men of Colorado—

State-wide meeting under sponsorship of
Electrical League of Colorado
Denver, March 26, 1926

Electrical Supply Jobbers' Association—

Annual Convention—Hot Springs, Va.
May 31-June 4, 1926

Pacific Coast Electrical Association—

Annual Convention—Biltmore Hotel, Los Angeles
June 8-11, 1926

Associated Manufacturers of Electrical Supplies—

Annual Convention—Hot Springs, Va.
June 7-12, 1926

National Electric Light Association—

Annual Convention—Atlantic City, N. J.
June 17-21, 1926

of Salt Lake City, was the principal speaker, using as his subject, "Utah and Its Possibilities." A talk on "Modern Commercial Distribution" was given by B. E. Rowley, district manager of the Edison Electric Appliance Company, and a speech on "Our Job" was delivered by B. C. J. Wheatlake, manager of the local branch of the General Electric Company. J. A. Kahn, president of the Capital Electric Company, was toastmaster.

Talks to Employees Delivered by Puget Sound Officials

R. M. Boykin, manager of the central district of the Puget Sound Power & Light Company, is carrying out a plan of talks to employees delivered by a number of company officials best qualified to explain company affairs and to instruct all members of the organization in the problems of management and operation. The first talks were given Dec. 2, the speakers being F. W. Brownell, comptroller, and George E. Quinan, chief electrical engineer. Mr. Brownell talked on "Financial Organization" and

Book Reviews

University of Illinois Issues Bulletin on Antenna Investigation.—Publication of Bulletin No. 147, "Investigation of Antennae by Means of Models", by J. T. Tykociner, has been announced by the Engineering Experiment Station of the University of Illinois, Urbana. It contains a discussion of the theoretical considerations involved in the use of scale models of antennas, and a description of different models with which experimental work has been done at the university. Copies may be obtained without charge by addressing the Engineering Experiment Station.

Patents (third edition) and Trade-Marks (fourth edition) are two useful little booklets recently issued by Richards & Geier, patent and trade-mark attorneys at 277 Broadway, New York City. The former of these booklets covers patent law and practice both domestic and foreign. Schedules of charges are given. The other booklet covers trade-marks and trade names and their registration, both domestic and foreign. Several pages are given to the discussion of trade-mark piracy. The publications will be distributed gratis to interested persons.

Personals

S. M. Kennedy, vice-president in charge of business development and public relations, Southern California Edison Company, Los Angeles, recently had an unfortunate accident which resulted in a broken hip and arm, which will cause an enforced absence from business for at least three or four months.

C. W. Wiggins, superintendent of electric production, and K. B. Ayres, superintendent of electric distribution, represented the San Diego Consolidated Gas & Electric Company at the P.C.E.A. Technical Section committee meetings in San Francisco recently.

L. W. Failor, for a number of years manager of the offices of the Puget Sound Power & Light Company at Auburn and Sumner, Wash., has been transferred to Olympia, Wash., where he will have charge of the sales department of the company. He has been succeeded at Auburn and Sumner by Roy McGandy, who has been with the power department of the company for many years.

H. L. Jackman, manager of the Eureka division, Western States Gas & Electric Company, Stockton, Calif., has been appointed assistant to H. H. Jones, newly elected vice-president and general manager of the company. In addition to his duties as assistant general manager of the company, Mr. Jackman will continue in his position as manager of the Eureka division.

H. J. Gille, general sales manager, Puget Sound Power & Light Company, Seattle, was the guest of honor at a dinner tendered him recently by officials and fellow employees at the Olympic Hotel in that city. The guests were: A. W. Leonard, president; W. H. McGrath, vice-president; F. H. Brownell, Hugh Tait, Harry B. Sewall, George Newell, W. J. Grambs, E. A. Batwell, James Wilmot, R. W. Clark, Dwight Ware, E. A. Crider, D. J. Tarance, and A. G. Gordon. George Quinn acted as toastmaster.

H. L. Barker, president of the Meadows Manufacturing Company, Bloomington, Ill., has been making the rounds of the Pacific Coast territory, accompanied by Clifford A. Williams, the company's Western sales manager. Not long ago he spent considerable time in San Francisco.

Arnold Pfau, in correcting a statement published in the Jan. 15 issue of the Journal of Electricity to the effect that he is president of the American Resistor Corporation, states that he was president of the American Resistor Company but that its assets have been taken over by the American Resistor Corporation and the company has ceased to exist. Mr. Pfau, the "old crowd" of the American Resistor Company, and the technical staff still are connected actively with the corporation, whose president is Joseph A. Steinmetz of Philadelphia. W. E. Duersten is vice-president and general manager in charge at the Milwaukee offices and works.

P. P. Pine, power sales engineer, San Diego Consolidated Gas & Electric Company, represented that company at the recent meeting of the Commercial Section, National Electric Light Association, in Chicago.

E. H. Pim, sales agent for the General Electric Company in Seattle, left recently for Los Angeles to attend the funeral of his father. The latter was connected years ago with the Canadian General Electric Company in Vancouver, B. C.

Tom Wood, Seattle representative of the Packard Electric Company, and vice-president of the Electric Club of Seattle, left early in January for a six weeks' business trip throughout the East. On his trip he will visit Chicago, New York, Canton and Columbus, Ohio, returning via Los Angeles and San Francisco.

E. S. Jenison, for five years general sales manager for The Goulds Manufacturing Company, Seneca Falls, N. Y., has become associated



E. S. JENISON

with Smith Booth Usher Company as vice-president and resident partner in San Francisco. He brings to the position an experience in engineering and sales work which makes him particularly well fitted for his new duties, for he spent two years in Porto Rico for the Otto Gas Engine Works, one year with Henion & Hubbell, Chicago, and thirteen years in the service of the Goulds Manufacturing Company. For that company he served three years with the Canadian Fairbanks Morse Company, Montreal, as manager of the pump, engine and electrical departments, and five years as manager for the Goulds company in Philadelphia, succeeding then to the position he recently left to form his new connection. Mr. Jenison is a native of Republic, Ohio, and a graduate from the University of Michigan in mechanical engineering.

A. F. Krippner has been appointed sales representative for Colorado for the Jeffery-Dewitt Insulator Company, Kenova, W. Va., and the Champion Switch Company, Buffalo, N. Y. His headquarters will be in Denver.

A. C. Cornell, Rocky Mountain district manager of the Graybar Electric Company and chairman of the Electrical League of Colorado, Denver, has been named a member of the radio interference committee appointed by the City Club of Denver.

J. F. Farquhar, general agent for The Washington Water Power Company, Spokane, recently made a trip to Boise, Idaho, in connection with the filing of new rates.

G. H. Pike, rate engineer, The Washington Water Power Company, Spokane, made a trip to Olympia, Wash., not long ago to file some new rates with the department of public works.

T. G. Aston, claim agent for The Washington Water Power Company, Spokane, lately returned from Olympia, Wash., where he attended the legislative session.

W. E. Durrant, of the Edison Electric Appliance Company, Spokane, has been made district manager of that company for eastern Washington, Oregon and northern Idaho. Mr. Durrant attended the Edison company's convention at its home office in Chicago the forepart of January.

W. J. Dennis, of Portland, assistant general manager of the Northwestern Electric Company, which has taken over the Kalama and Woodland, Wash., and Rainier, Ore., electric systems from the Puget Sound Power & Light Company, a short while ago completed a trip of inspection over the company's new holdings. E. Snyder, manager of the Northwestern Electric Company's office at Ridgefield, Wash., has been named district manager for the newly acquired systems.

Walter M. Fagan has joined the Electric Corporation of Los Angeles as general sales manager. In making this connection Mr. Fagan is renewing West Coast contacts which were broken in 1909 when he went East to join the Chicago branch of the Crouse-Hinds Company of Syracuse, N. Y. He left that company in 1915 to become sales manager for the Hughes Electric Heating Company. When that company later merged with the Hotpoint company, Mr. Fagan remained in charge of sales. When the Hotpoint company became a part of the Edison Electric Appliance Company, Mr. Fagan was made national sales manager of the Hotpoint division. He left that position to come West on personal



WALTER M. FAGAN

business and the wonderful promise for the electrical trade on the Coast induced him to accept the offer of the Electric Corporation. Mr. Fagan is a brother of Frank D. Fagan, special representative of the International General Electric Company in Japan.

TRADE NOTES

Wagner Electric Corporation, St. Louis, has issued bulletin 137 describing and illustrating wound-rotor slipping polyphase motors.

The Rainier Electric Bake Oven & Equipment Company, Seattle, will move to its new home under construction at 1413-19 Jackson Street. The new plant is 75x96 ft. in size, one-story frame and masonry construction.

Curtis Lighting of California, Inc., San Francisco, has changed its address to 416 Foxcroft Building. It formerly was located at 507 Foxcroft Building.

Packard Electric Company, Warren, Ohio, has issued a two-page leaflet announcing improvements in design of the Packard type K current transformers.

American Electric Fusion Corporation, Chicago, has issued a new folder on electric welding, giving the principles of electric spot, butt and seam welding.

Hobart Brothers Company, Troy, Ohio, is introducing a new feature, known as the HB electrical test bench, which it claims is unusually low priced and has many advantageous features.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, has issued Circular 7378 on Materials Handling that shows the beneficial results to be obtained in the various industries through the use of electrically driven machinery for the handling of materials.

The Mutual Electric & Machine Company, Detroit, manufacturer of "Bull Dog" electrical products, has added a new type of safety fuser to its line, known as the Type "AF". It is a combination of standard units of high-grade moulded composition blocks, mounted on a steel plate which is adjustable in all directions so as to make it conform to the wall line.

Link-Belt Company, Chicago, has issued a booklet No. 895, containing 48 pages, generously illustrated to show the use of the drag-line, dipper and trench shovel, skimmer scoop, hook blocks and pile drivers and giving other data on its type of crawler. Information on lifting capacities, approximate operating speeds, and line pull and tables in which the data are arranged also are given.

Celite Products Company, Los Angeles, has issued bulletin No. 314, which is now available to those interested in concrete construction. The bulletin is illustrated with photographs and drawings and fully describes the company's products.

The Allen-Bradley Company, Milwaukee, manufacture of electrical controlling apparatus, has published a bulletin on its type C-1220 current-limit automatic direct-current starter for machine tool service or similar applications.

Pacific Electric Manufacturing Company, San Francisco, has issued Bulletin T, which describes its line of high-tension switches.

Ludlum Steel Company, Watervliet, N. Y., has appointed G. L. Hulben as a member of the sales force of the Chicago branch of the company.

General Electric Company, Schenectady, describes its line of steam turbines in Bulletin No. GEA-235 recently issued by the company. Illustrations and drawings are given, and construction and operation discussed.

The Cutler-Hammer Manufacturing Company, Milwaukee, has produced a new watertight, acid-resisting, remote-control station. The mechanism is enclosed in a cast-iron case and has a cover fitted with a gasket, which excludes all moisture and fumes.

The Jeffery-Dewitt Insulator Company, Kenova, W. Va., and the Champion Switch Company, Buffalo, N. Y., have announced the appointment of A. F. Krippner as sales representative for Colorado, with headquarters at Denver.

The Robbins & Myers Company, Springfield, Ohio, has issued a pocket-size fan catalog which covers its complete lines of fans for the season of 1926. The different models are shown in the illustrations and are described fully. Complete price lists are given.

Circle F Manufacturing Company, Trenton, N. J., now is established in its new office building at 720 Monmouth Street.

Alexander & Lavenson Electrical Supply Company, San Francisco, has announced that it will carry a complete line of General Electric wiring devices and other products manufactured by that company.

Simplex Wire & Cable Company, Boston, has opened a branch office in the Union Trust Building, Cleveland, in order to take better care of its steadily increasing volume of business. W. H. LaMond will be manager of the new office.

The Okonite Company and The Okonite-Callender Company, Inc., have announced, through their Pacific Coast manager, J. L. Phillips, the following changes in their Pacific Coast representation: A new office has been opened in Seattle in the Hoge Building, with W. R. Hendrey as special representative. E. H. Jones has been appointed special representative of the two companies in the Los Angeles district, with offices in the A. G. Bartlett Building. The San Francisco office, which continues to be headquarters of the Pacific Coast manager, has moved from Room 750 Monadnock Building to Rooms 370-372 in the same building.

Roller-Smith Company, New York, has issued Bulletin No. 200, covering its new device, the type BBT rail bond tester. The bulletin is illustrated and contains a complete price list.

The Ideal Electric & Manufacturing Company, Mansfield, Ohio, describes its line of ideal switchboards and synchronous motor starting panels in their new Bulletin No. 111. Several views of the switchboard are given in the illustrations, and eight points of protection are enumerated.

The George L. Dyer Company, New York City, has moved its offices from 42 Broadway to Murray Hill Building, 285 Madison Avenue, where it will occupy the entire twentieth floor.

Allis-Chalmers Manufacturing Company, Milwaukee, has issued Bulletin No. 1132 relating to roller bearing motors. Two types are illustrated in the folder.

The Beacon Light Company, of 716 South Hill Street, Los Angeles, Calif., has opened a new branch store at 4605 Beverly Boulevard. The new branch is to be in charge of A. C. Miller, who has been associated with the company for several years. R. G. Logue is president and general manager of the Beacon Light Company.

Harvey Hubbell, Inc., of Bridgeport, Conn., announces a new line of black porcelain convenience outlets with plain faces. The face of this new outlet is smooth, unmarked and highly glazed.



Methuselahs, or what have you! These men represent 392 years of service, an average of nearly 15 years per man. And they are the San Francisco officials, department heads, and salesmen of the newly named Graybar Electric Company. From left to right they are: Top row: Messrs. Crilly, Brunner, Fryklund, Martinez, Thomson, Curry, Simmons, Chapman, Miserez, Case. Middle row—Messrs. Buttner, Johnson, Caven, Crowson, Vorum, Jesse, Holabird, Treat (manager San Francisco house, Western Electric Company), Mathison, Huyck. Lower row—Messrs. Weyand, Neelands, Bray (credit manager), Wallis (Pacific Coast manager), Berry (San Francisco manager), Nicoll (sales manager), Fryer (accountant), Brown (stores manager).

Journal of Electricity

Devoted to the Economic Production and Commercial Application of Electricity
IN THE ELEVEN WESTERN STATES

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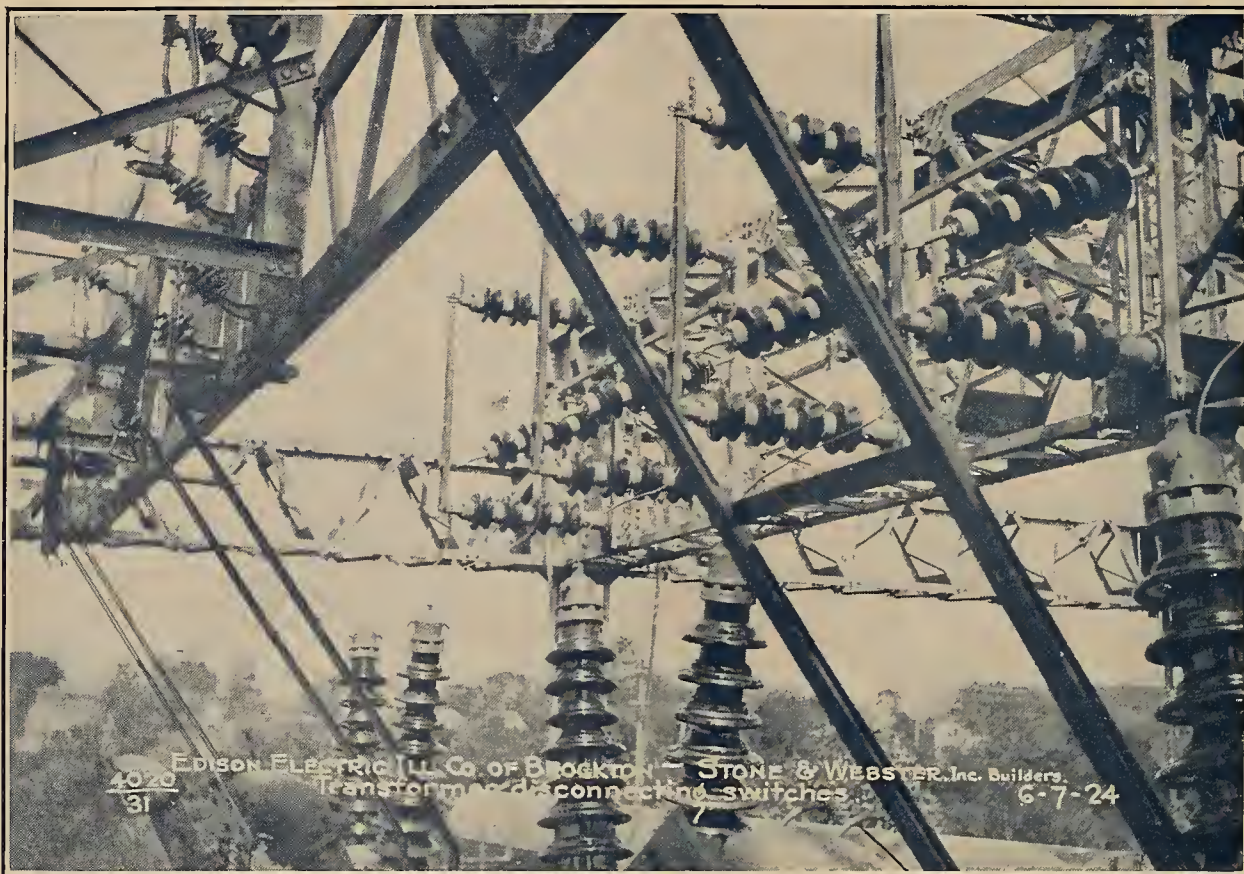
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Proof

IF "proof of the pudding is in the eating," then the experience of one large electrical manufacturer during the past eight years offers mute testimony to the soundness of the McGraw-Hill Four Principles of Industrial Marketing. On pages 30 and 31 of this issue is reproduced the eighth of a series of advertisements prepared by the McGraw-Hill Company to arouse a national recognition of the need for improving industrial sales efficiency, and to awaken a keener interest in the correct principles of industrial selling. In this advertisement the experiences of this particular manufacturer are cited to show how, despite shifting markets and constant changes in equipment, sales steadily mounted because:

1. The manufacturer analyzed each market and accurately appraised its sales possibilities. (Market Determination).

2. Contact was established with the men who came closest to the problems involving the use of this manufacturer's products. Buying habits were studied. (Buying Habits).

3. Sales promotion efforts were directed toward the proper persons through a balanced program involving publicity, manufacturer's literature, special sales work and exhibits. (Channels of Approach).

4. Advertisements and literature were changed from mere descriptions of products and made a source of helpful information. (Appeals that Influence).

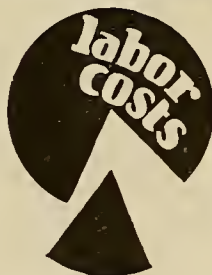
These same principles may be applied to any selling problem. The McGraw-Hill staff of Marketing Counselors is available to any manufacturer. Its counsel is offered freely in the interests of efficient selling to industry.

Labor cost
is the
big question
in wiring
that old house



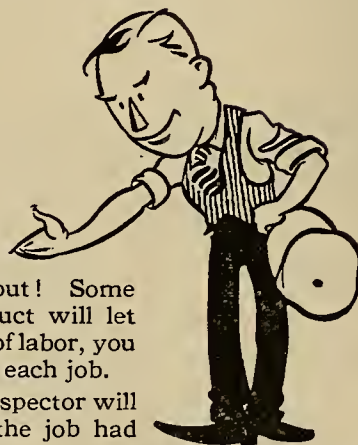
DURADUCT

Reg. U. S. Pat. Off.



will cut labor costs because the single wall and the *roller bearing wireway* make faster fishing. — It's one of the

**DURABILT
PRODUCTS**



Well, the secret has finally leaked out! Some wise feller has discovered that if Duraduct will let you do the same work with less hours of labor, you are in danger of makin' more money on each job.

Mr. Jobber, Mr. Contractor, and Mr. Inspector will now sing that sweet refrain, "We saw the job had Duraduct—we *know* you're satisfied."

Dura Bill

TUBULAR WOVEN FABRIC COMPANY :: PAWTUCKET, R. I.

EDITORIAL

The Mutualization of the Public Utility

FROM the brain of a Western power company executive and the pen of a Western financial writer has come a thought with which utility-finance men may conjure, perhaps with profit. The thought deals with the coined expression, "service dividends." The plan involves the distribution of earnings above the return allowed by public service commissions among the consumers, the management-labor group and the stockholders of a public utility on a pro rata basis. The originators of the suggestion reason that, under such an incentive, these groups will put forth extraordinary efforts to extend the sale of electricity, appliances and stock, and to promote economy in operation and technical improvements through inventions. If increased earnings should result, the excess above the allowable return would be distributed, one-half to consumers and one-half to management-labor and stockholders.

To the consumers such a service dividend might mean the operation of a washing machine for a year without cost. To the workers and employees it would represent extra compensation for efficient work and to the stockholders it would amount to an extra dividend.

The idea, while new, insofar as utilities are concerned, has been tried successfully in other businesses, notably by life insurance companies. Mutual companies have existed for many years, and there are few companies which do not pay dividends to policy holders. All of us have had the pleasurable experience of receiving a notice from our insurance company at the end of the year that several dollars are available as a dividend on our policy—the money representing the saving between actual and estimated cost of doing business. Why should not the same procedure be applied to the utilities?

At some future time service dividends might become the easy and automatic means of adjusting electric and other public-utility rates between producer and consumer. There seems no good reason why a dividend check at the end of a year based upon the bills of a consumer might not be a quicker and more flexible means of giving to the consumer the benefits of reduced costs of service than a rate cut. From the standpoint of the stockholder-partner in a public-utility company a small portion of the savings produced by efficiency might be added to his dividend check as his portion of the profits arising from the economical conduct of the business in which he is an investor. Labor and management also might be the recipient of service

dividends which would have a tendency to inspire economy and efficiency and somewhat offset the one effect of strict regulation—namely, penalizing efficiency.

At any rate the thought that service dividends might act as an equitable means of adjusting fluctuating conditions in rates, stock dividends and payrolls is a constructive one.

Emotion and Water Rights

SECRETARY Hoover, in speaking of the Colorado River situation not long ago, made this sage remark, "It took ten years to secure the ratification of the federal constitution, and I doubt if there was as much emotion connected with that ratification as there is in the matter of water rights."

Compared to the federal constitution, then, is the Colorado River to assume a place of importance far in excess of the fundamentals of American government? This seems an unnecessary magnification of a relatively unimportant matter, yet it is undoubtedly true. Perhaps this is because the constitution is a more or less abstract document, setting forth principles under which people shall be governed. With water rights, however, the question is one of immediate monetary or commercial importance, and hence valued in the immediate sense out of all proportion to its enduring worth.

It is extremely unfortunate that so utilitarian a development as might result from harnessing the Colorado River for flood control, irrigation and power generation cannot be accomplished without emotion. Emotion has no place in engineering, and this is purely an engineering job. To clothe it in the emotion with which it now seems swathed results only in endangering its engineering possibilities. Whatever finally is done about the Colorado River is bound to be unsatisfactory to someone. And it is more than likely that whatever is done will be colored by some emotional consideration or other that will have little or no regard for true engineering requirements.

Mixing emotion with concrete and steel always is expensive. Not infrequently it results in a weakened structure. Once the emotion has spent itself as it finally does, the engineering stands as a more or less scarred monument to some passing wave of feeling.

Unfortunate it is, then, that so much emotion surrounds the Colorado River situation. It will make so much farther off that day when the Imperial Valley may find safety from flood waters

and yet have adequate water for irrigation. It will delay that day when any of six or seven states may receive benefits from a river with great potentialities for useful work. It will, in truth, keep impotent one of the factors that will mean much to the development of the entire West.

Forty Per Cent of Domestic Consumers Are Electric Refrigerator Prospects

"**F**ORTY per cent of the domestic consumers on the lines of our company are prospects for electric refrigerators." So speaks the chief executive of one of the largest central stations in the West. He continues, "This number of refrigerators will not be sold in a day or a year, but three or perhaps five years from now the majority of these homes will be getting their ice over the lines of our company." His conclusions are based upon the number of substantial citizens in the territory his company serves who own their homes and their automobiles; upon the fact that the use of ice in this territory is almost imperative for the preservation of food and foremost, upon the belief that the electric refrigerator is the greatest boon ever offered to the American housewife by the electrical industry, even including the washing machine, the vacuum cleaner and the electric range.

Whether or not the forty per cent which this company feels will apply in its case will hold for other companies, the fact remains that the electric refrigerator presents untold opportunities for the development of new and profitable business for the central station. If it offers the possibilities which this executive feels it does, it should find a place on the program of every power-company commercial department at least equal to the position granted the electric range. It is our prediction that refrigerator sales next year will exceed range sales in the West where the electric range has its widest use. There is every reason to believe that in time electric refrigerators will replace the ice chest in every home now using ice.

There is no time like the present to begin the study and development of the domestic refrigeration load. Successful merchandising will come only from experience, and there can be no experience until a start is made.

Paying Customs to Yourself

CONTENDING that since magazines carry much advertising they should pay a duty in proportion to the amount of advertising they contain, a Canadian magazine believes that such a move on the part of the Canadian government would protect Canadian publications. It seems that advertising brought into Canada from the States must pay a duty of 15 cents a pound. And the Ontario Associated Boards of Trade and Chambers of Commerce, it appears, has asked that magazines imported should pay a similar duty.

The argument is based on a feeling that "advertising in American magazines creates a large Canadian demand for a variety of American-made goods." It is expressed further that a wide distri-

bution of American magazines is not in the interests of Canadian nationalism. As a specific example an editorial in favor of Canadian export of hydroelectric power is cited in which, it was stated, the point of view was entirely in the interests of United States industry. This is called propaganda by the Canadian magazine.

No doubt there is much justification in the feelings expressed, especially from a Canadian point of view. And yet an import duty on magazines merely results in an added burden on the recipient of the magazine and is not particularly a deterrent to the publisher. The customer pays the duty, in other words, and whether the viewpoint of the magazine is Canadian or United States, if he wants the magazine for the information it contains, for the value it may have to his own activities, even for that opposite point of view, as well he may, it is hardly fair to charge him for the advertising the magazine contains.

It is true that American advertising creates a demand for American goods. That is what it is for. It may be possible that advertising in Canadian magazines which find some circulation in the United States creates an American demand for Canadian goods. That, too, is what advertising is for. Just because the advertising emanates from one side or another of an imaginary line cannot change its appeal materially.

An embargo on intelligence, however, is a serious matter. It cannot but impoverish in proportion to its effectiveness the nation which places the embargo upon itself. Whatever international commercial maladjustments may exist are of minor importance compared to the dissemination of useful and established facts about methods of work or procedure. It would be a blunder for Canadians or nationals of any other country to block the flow of ideas into their country. Whether they could use them or not, or would care to, should rest with local conditions and with individual discrimination.

Constructive Plan for Dealer

Co-operation Devised by Jobber

CO-OPERATION with dealers is a subject that has been discussed by practically every jobber of electrical supplies, and many methods have been tried to bring about the desired result. One constructive plan that has been brought to our attention is described elsewhere in this issue. In an effort to bring about a better understanding of merchandising problems by electrical dealers, this particular jobber invites the dealers and their wives to a monthly meeting to discuss those problems. The meetings are non-commercial in nature and are intended to supply constructive suggestions a timely subject is discussed by a competent which will benefit the dealer. At each meeting speaker. The sponsoring of these meetings is a commendable move on the part of the jobber and others who are aiding in their success. It is an example of the work which is being done by various groups in the industry in an effort to keep the men who supply the public with electrical appliances abreast of the times.

Constructive vs. Destructive**Appliance-Selling Arguments**

SALESPEOPLE are tempted to use destructive sales arguments when business begins to tighten up. This practice causes people to "shop" from store to store and results in increased selling costs.

Consider the salesman talking with a woman prospect for a washing machine. She is interested, and her desire to own the machine is built up as he tells her the many advantages of doing the washing at home with an electric washing machine. He climaxes his sales talk by saying, "Our washing machines won't tear clothes!" Until that statement was made the woman did not think that any machine would tear clothes.

Immediately her interest subsides, and she becomes skeptical of all washing machines if the insinuation is true that some other washing machine will tear clothes. She wants to hear about some other machine and also check up the salesman's statements. She goes to several other stores and hears that the particular make of machine handled in each won't tear clothes. She feels someone is a liar and wants to go home and "think it over"—her desire to purchase on that particular day is killed. This "shopping tendency and wanting to "think it over" increase the cost of selling.

Salesmen should be instructed to use constructive selling arguments only. They should sell the idea of performing the operation electrically; that all standard appliances are good. They should not be allowed to vary from this policy.

A Publicity Job**that Is Incomplete**

THE knowledge that ignorance breeds suspicion and distrust is one of the fundamentals of good public relations. It has a direct and indisputable bearing upon the success of every electrical utility doing business today. Definite efforts are made by most of the progressive organizations to acquaint their customers in particular and the public in general with their financial structure, their business policies and their commercial activities. Sincere efforts are made to spread far and wide a general knowledge of the utility's business and to deal with the public squarely.

One important point has been overlooked, however, in these programs of publicity. The general public does not understand the difficult problems that face the engineering, construction and operating departments. It knows nothing of the weeks and months of study and research that attend many of the problems of these departments; it does not appreciate the vital nature of the work of the technical staff.

There is a way to combat this difficulty and that is for the electrical utilities to incorporate definitely in their advertising and publicity a continuous stream of information that will give the public at least a general idea of their technical activities. The dissemination of such authentic information should be a logical part of this program. To overlook it is to leave an unprotected flank.

DISCUSSION**Manufacturer Expresses Dislike for
Congratulatory Advertising**

To the Editor:

Sir—You have struck a very responsive chord in our advertising policy in your editorial on page 2 of the Jan. 1 issue of the Journal of Electricity.

We have long since definitely expressed ourselves as against the practice of congratulatory advertising.

S. S. SONDLER,

Oakland, Calif.

Feb. 1, 1926.

Manager Advertising Dept.
The Magnavox Company.

**Electric Truck Distributor Sees Better
Business for Future**

To the Editor:

Sir—I was very much interested in your editorial in the Jan. 1 edition of the Journal of Electricity regarding the apparent sleeping sickness of the electric truck industry.

As I am the distributor in the Portland territory for the Commercial Truck Company I have a good opportunity to study conditions relative to the backwardness of the industry as reflected in this territory.

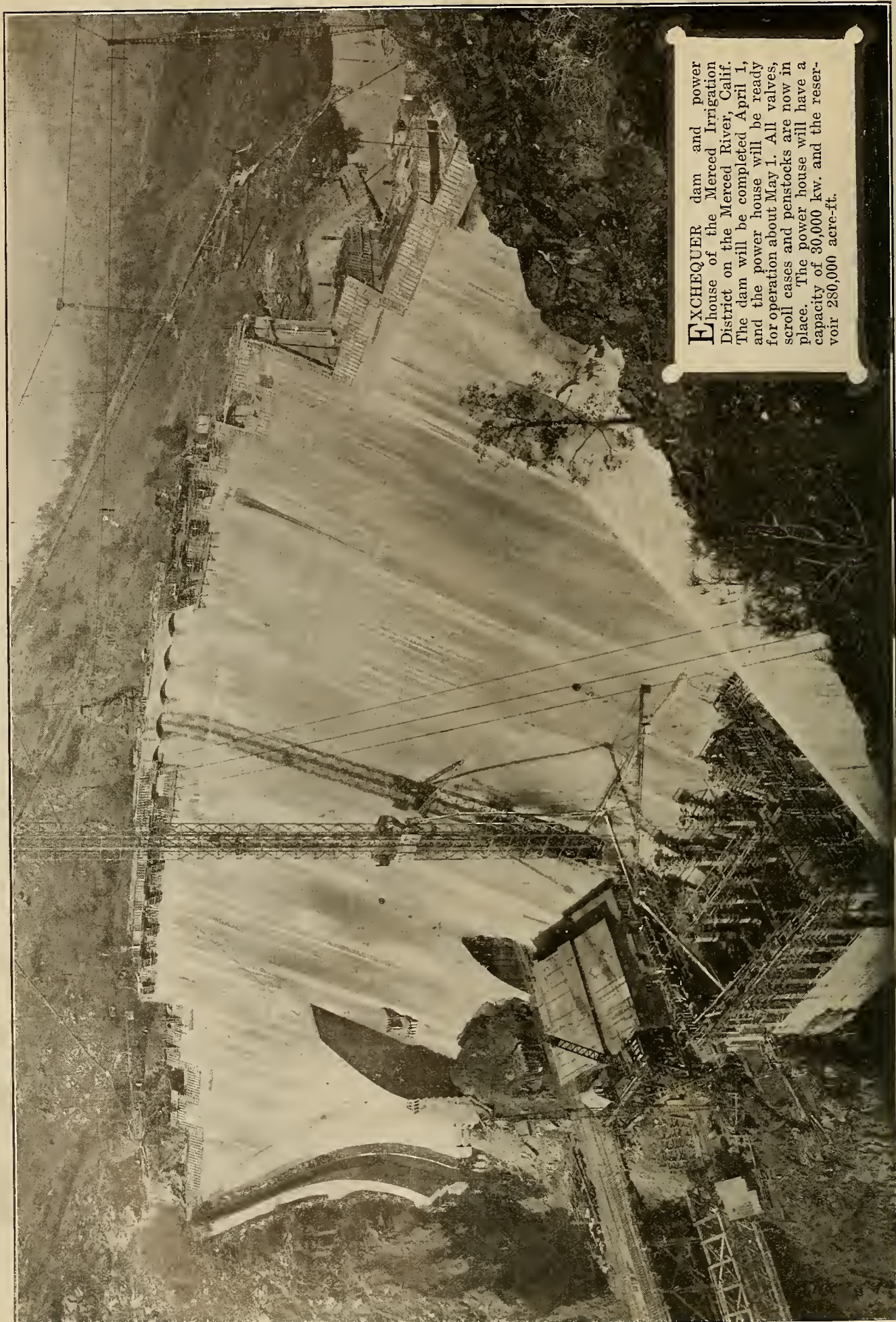
The paramount cause for the slowness of the electric truck business in this city seems to have sprung from some of the early trials by several concerns about ten years ago. Most of these trials eventually proved to be a failure which was due to several obvious reasons, the principal ones being inefficient trucks, many unpaved streets and a scattered population. These conditions have undergone a radical change and the present cannot be judged by the past.

The power companies of this city having observed these failures have been slow to get behind this business. However, this condition is changing and they are beginning to boost the electric truck industry, but there is much to be done yet before the transportation men of the West realize what the modern electric truck will do.

The electric truck manufacturers have been very conservative in their sales promotion in the past, but I anticipate a change in this policy in the near future, due to the increased demand for the electric truck. The greatest present need, according to my viewpoint, is more co-operation between the electric truck manufacturers and the power companies. This will undoubtedly put the electric truck in its right place and will effect a large saving to city transportation men.

HAL. E. COWGILL, Distributor,
Commercial Truck Company.

Portland, Ore.,
Jan. 18, 1926.



EXCHEQUER dam and power house of the Merced Irrigation District on the Merced River, Calif. The dam will be completed April 1, and the power house will be ready for operation about May 1. All valves, scroll cases and penstocks are now in place. The power house will have a capacity of 30,000 kw. and the reservoir 280,000 acre-ft.

Artificial Light

Its Accomplishments and Achievements*

THERE is a group of men who deal with the fastest known element in existence—light—whose speed is 186,000 miles per second. It takes eight minutes and twenty seconds for the light of the sun to reach the earth, the sun being 93,000,000 miles away.

We marvel at the courage and daring of men who in airplanes have succeeded in attaining a speed of 300 miles per hour. If this could be kept up (and some day it undoubtedly will) it would take 18,600,000 minutes to cover the distance between the earth and the sun. Eighteen million six hundred thousand minutes is 310,000 hours, or thirty-six years.

Compare thirty-six years with eight minutes. Yet the group of men who are dealing with the eight-minute element are hardly known.

Lighting experts can send a beam of light twelve miles into the air instantly. The greatest altitude reached so far by airplane has been approximately seven miles and that has only been accomplished once.

We occasionally read a front-page headline something like this in effect, "Daring Aviators Plan Night Flying," then in smaller type (indicating secondary importance), "with the aid of powerful searchlights as beacons." And that's the point. "Powerful searchlights"—quicker than the flash of an eye—send beams of light, thousands of candlepower, miles into the air, and controlled, absolutely controlled. It is this which makes the art and science of artificial light most attractive and interesting, especially to its makers.

And it is of light control, or controlled light, we want to talk today.

Compare for a moment the mighty beams of searchlights used as beacons at sea for the protection of human lives, to the tiny light emitted from a lamp the size of a grain of wheat, used in a doctor's instrument. The following story clearly illustrates the point:

A few years ago a little boy somehow got a peanut lodged in his throat in such a way that unless it could be removed he would slowly choke to death. The child's father sent for the doctor at once, and for an hour and a half the physician worked over the lad's tiny throat. If he could not

WHAT the makers of artificial light have done with their medium is summed up in this comprehensive and yet simply stated lecture. It presents a record of achievement in illumination, and yet points to possibilities for future and more thorough application of artificial light to the various phases of human activity.

get the stubborn little particle out, the child would die. If in his efforts he pushed it ever so little in the wrong direction, the boy would choke at once. If at one instant the doctor's hand had faltered, or struck wrong, the child's fight would have been lost. And afterward when the boy's father gave the doctor a beautiful cigarette-case it wasn't with any sense of marking his grati-

tude; it was just a little remainder of something that he hoped the physician would never forget.

The doctor's skill saved the child's life. But not the doctor's skill alone. There was something else, without which all the skill in the world would have been helpless. There was one little thing, something hardly anyone would have noticed at all, except as a "matter of course," without which no power on earth could have saved the boy. In the darkness of the little throat the doctor must have light. He could see. The little boy's life depended upon and was saved by electric light.

And so on through the whole range of artificial light-making, giving us pride in our achievements; giving us also the right to be proud of the advance in the art and science of illumination, which has brought safety in the streets, efficiency in industry and commerce, elimination of eye-strain and fatigue in class study, and last but not least, has brought comfort, cheerfulness and happiness into the home.

And yet, do we enjoy all of these things? I don't believe we do; not because they are not there, but because we perhaps haven't as yet fully realized the completeness and fullness with which we could enjoy all of them if the application of artificial light was employed properly.

The Organ with Which We See Light

In order that we may know why light should be employed properly it is necessary for us to understand something about that part of our body which functions with light, the eye. Light and sight are related so closely that without one the other would be useless.

The history of the human race might well be sketched in the history of light.

It safely may be said the eye is the most marvelous piece of machinery in the human body. Likewise, the eye is the most flexible and abuse-resisting organ we possess. In main structural characteristics the eye is like a camera, though a

*Educational lecture, illustrated by the use of a special light box constructed for the purpose, given before the luncheon clubs of California as part of the program of the Lighting Committee of the Commercial Section, Pacific Coast Electrical Association, 1925-1926. Clark Baker, chairman; L. A. Hobbs, vice-chairman; C. D. Monteith, vice-chairman.

camera is more or less an arbitrary medium, whereas the eye is flexible. (Fig. 1.)

In considering proper or improper lighting in relation to the eye, there are two main abuses—gloom and glare; gloom caused by too little light; and glare, by too much light reaching the eye from an improper direction or misplaced light source.

First then, let us consider the effect of gloom on the eye. The human eye, chemically, is adaptable to such a degree that it can differentiate between relative degrees of light, and mechanically adapt-

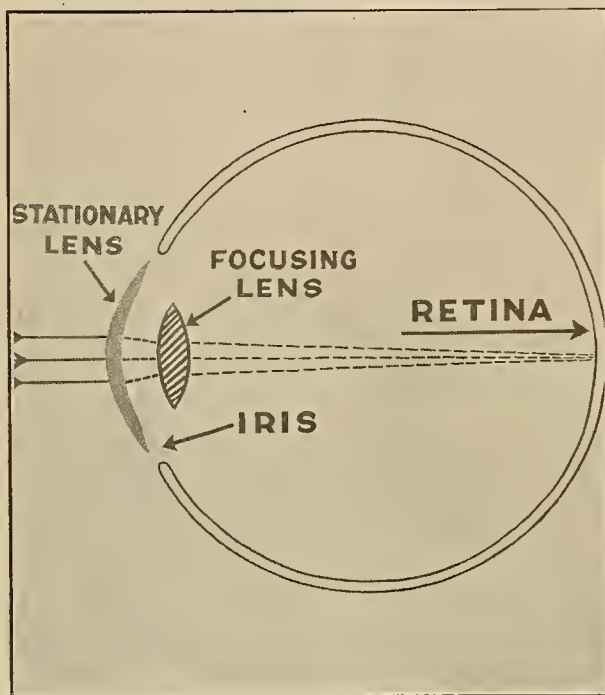


Fig. 1. Light enters the eye through the stationary lens, the iris opens or closes, automatically controlling the amount of light that should be received, then passes through the focusing lens, focusing an image on the retina.

able to such a degree as to differentiate form. Therefore, the recognition of detail needs varying degrees of light or illumination upon the form object.

For instance, if we were to have an object 14 or 15 inches from the eye (which is normal reading distance), with sufficient light upon it, an image of a certain size would be focused on the retina of our eye. Assume, however, there should not be enough light falling on the object to be seen clearly at this distance. The only other thing to do then is to draw the object closer to the eye, which would enlarge the image on the retina. (Fig. 2.) But in doing this, we do two things, one dangerous, the other unnatural. The dangerous thing is accident hazard; the nearer a worker's eyes are to moving objects, the greater the danger of accidents to them. Likewise, in the case of fast-moving machinery, there is the danger of clothes getting caught, and so on.

The unnatural thing is that whenever we bring an object close to our eyes we have to turn the eyes inward so as to focus properly, and this demands muscular effort on the part of little delicate eye muscles. These eye muscles are not made

for prolonged exertion, but are made for fine and quick adjustments. This prolonged turning-in (Fig. 2a) taxes the nervous system and produces one of the most common forms of eye-strain.

Furthermore every inch closer to our faces that we bring an object shortens our focus. This also is an act that nature never meant us to maintain for long periods of time. The mechanism back of this act is one of the most delicate muscular parts of the entire body, and the drain upon nerve energy from this source produces not merely eye-strain but extreme general bodily fatigue.

We shall turn now to the equal and much more common matter, glare. This, you will remember, we spoke of as too much light reaching the eye from an improper direction, or misplaced light source, and inasmuch as we demonstrate glare and its effect a little later, we shall pass it for the moment and describe it at the time of its demonstration.

We spoke of safety in the streets. Surveys conducted in the larger cities where they have what is commonly called "White Ways" or "Paths of Gold," together with other well-lighted streets, show a 78-per cent decrease in crime, likewise a 31-per cent decrease in street accidents. These results are directly traceable to the scientific study of illumination in the streets by lighting experts and specialists. A totally different study is required in the down-town section of a city from that of a semi-business district, while the outlying and residence sections require still another application.

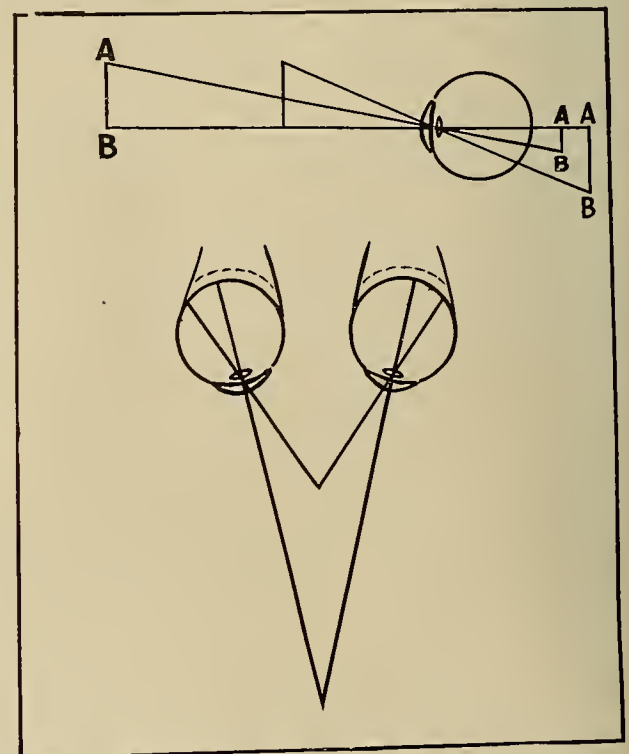


Fig. 2. What happens when an object is brought closer to the eye because of insufficient light. The object at A throws an image upon the retina of a certain size. Brought closer to the eye, the image upon the retina is enlarged. Fig. 2a. shows the abnormal position which the eyes must assume when the object is brought nearer and the strain which must be experienced by the delicate eye muscles to meet this condition.

Good Light for Young Eyes

From the street we enter the schoolroom. This phase of lighting has had a more extensive study by lighting experts than many other phases of lighting because it first of all affects our younger generation. Likewise, by reason of more experience and experiments in this field, more data have been compiled. Recent extensive surveys have shown that at least 25 per cent of our school children have defective eyesight. In the lower grades the percentage is less than this, but there are marked increases in the number and extent of eye defects as the children progress through the school life.

Let us consider for a moment that official figures as to school enrollment in the United States are placed at 24,000,000 children. Of these it has been estimated officially that 25 per cent, or 6,000,000, have defective vision. Of those having defective vision it has been estimated further that 67 per cent, or 4,020,000, are retarded in their study from this cause. At the cost of \$64.15 per pupil per year, established as an average by the schools of the nation, this means that \$257,800,000 is used ineffectively because of:

- Poor control of natural light.
- Incorrect artificial light.
- Glare from highly polished surfaces.
- Home reading in poor light, or none at all.
- Distance at which work is held.
- Poorly lighted blackboards.
- Blackboards wrongly placed in respect to windows.
- Too much contrast in room.
- Lack of education on the use of light with respect to the eye.

A detailed discussion of each of these items would be a story in itself. However, they have been and are agreed upon by not only illumination engineers but those in authority on optometry, also by physicians who specialize on the eye, together with the executives of our educational institutions, as being those things that are partly responsible for this 25 per cent of children having defective vision. These same authorities agree correction of the items mentioned will remedy this condition.

The growing use of schools for night courses makes it doubly important that lighting specialists

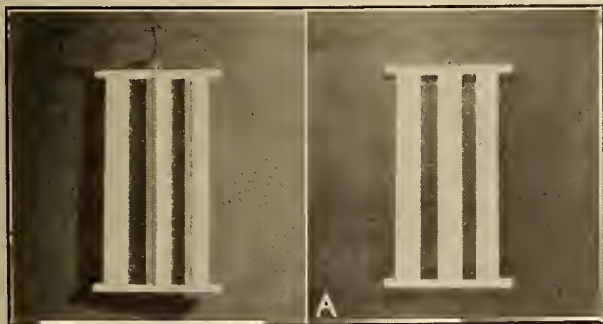


Fig. 3. The direction of light upon an object determines the position of the resulting shadow. Sharp shadows will confuse as to the true position of the object, for often the object will become confused with its shadow. However, without shadow we cannot observe objects in their three dimensions.

give their best efforts to research and study of this field of lighting, since the night classes are of necessity entirely dependent on artificial illumination.

As a result of the work of illuminating engineers and specialists, a code of lighting school buildings has been prepared by a committee consisting of twenty organizations and societies identified with school-lighting problems in one or another of its various aspects. The American Engineering Standards Committee has approved this code as the

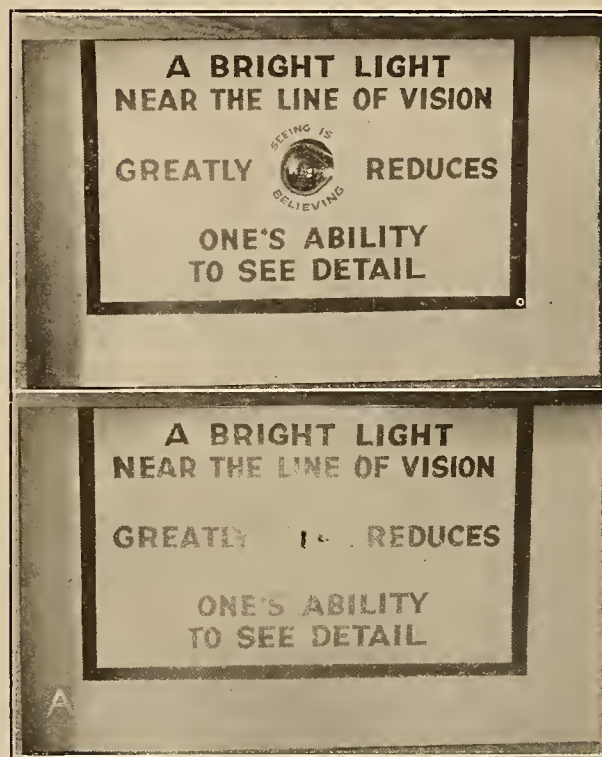


Fig. 4. Effect of glare is shown by the inability to read this glare chart when light in the center is turned on full.

American standard. It now serves as a guide for the enactment of legislation on school-lighting and also provides architects with detailed information on which to base proper school-lighting specifications. This is an achievement makers of artificial light are proud of.

The Worker Needs Adequate Light

As we approach industry, the factory or manufacturing plant is our first contact. In this field lighting engineers and lighting specialists have many accomplishments and achievements marked up to their credit. However, here we must effect economic efficiency. We have been able actually to increase production by reason of good illumination and have decreased spoilage to a very large extent by reason of good illumination, together with largely eliminating accident hazards. This latter is of prime importance and has had much of the lighting engineer's time.

Insurance and Accident Commission statistics show that 18 per cent of all industrial accidents are due to poor or inadequate illumination.

To demonstrate one or two lighting principles which are effective in the factory, let us consider first the question of shadows. If sharp shadows are permitted, the object will be confused with its shadow. Likewise sharp or heavy shadows will confuse as to the true position of an object. (Fig. 3.)

The opposite to this is the absence of shadows. Without shadow we cannot observe objects in their three dimensions. An equal amount of light falling upon object from all directions does not permit true form recognition. There is a happy medium between sharp shadows and the entire elimination of them that speeds labor and prevents accidents.

The next demonstration is one of the greatest evil in lighting practice, glare. It not only reduces one's ability to see detail clearly and quickly but has been known to effect temporary blindness.

This chart (Fig. 4) shows what occurs when glaring light enters the eye. You now are looking right into the eye; this outer circle represents the retina. Every sensation we have of sight is first registered upon the retina, light, color, form, everything. This little spot $1/50$ of an inch in area is the center of form vision as distinguished from light perception. Glaring light or too much light entering the eye from an improper direction over-stimulates or over-lights the area around this central point to such a degree that form vision or recognition is destroyed.

A study of these things we have just demonstrated, namely, shadows, glare and light diffusion, does not confine itself to factory work alone, but comes in for a major part of the engineer's attention when we go into the factory executive's office or into offices generally.

We find in clerical work with too low an intensity of lighting that the eye soon is fatigued, while glaring light sources or glaring reflection surfaces, such as glass-topped desks, glossy or shiny paper, seriously impair the efficiency of employees. With dancing or shifting shadows on typewriter keys,

eye-strain is introduced. These effects are particularly serious in clerical and stenographic offices where a high percentage of women are employed. A study shows that women by nature are more sensitive to such effects than men. Lighting engineers, time after time, have increased efficiency in office work and reduced the number of absentees by properly installed high-intensity lighting in offices.

There are many other elements entering into office lighting, such as kinds of paper used, objects of brightness, placing of desks for natural light vs. artificial light, desk lamps and similar factors. Time here does not permit a discussion of these, and it is to be regretted, for their importance goes hand in hand not only with the efficiency, but the comfort and health of the office employee.

Light That Helps to Sell

In a store also the question of employees' comfort and health has been effectively dealt with. Store merchandisers have warmly received and highly praised makers of artificial light for their contribution to better merchandising by reason of better lighting. Unselfish and non-commercial study has been made by specialists in this field, all of which now, however, have a commercial value to all concerned. This is the natural outcome of research work. Modern merchants, satisfying themselves of the value of the right kind of light, now demand it as an integral part of modern merchandising.

The term, "right kind of light," covers a great many points, all of equal importance. A discussion of each perhaps would be interesting. We shall confine ourselves, however, on account of time, to a demonstration of one principle largely involved, that is, light absorption.

This demonstration will show why one section of a store will have a different appearance from that of another section, when the lighting units used are the same in each case. (Figs. 5 and 5 a.) These conditions, once understood, are easily corrected. And many other things, presumably as simple, have brought about a greater understanding and appreciation of light principles and fundamentals as applied to the merchant.

Another important appreciation of light that the merchant today has is the psychological effect it has upon a purchaser, who may shop more readily and more comfortably under good illumination than poor illumination, and as before mentioned, upon the employees, that is, the salespeople, who are more cheerful and whose health is better when they work under the right kind and the right amount of light.

Merchants likewise have responded to engineering and research data as to the value of good lighting in show windows. They know that light has a definite attracting or pulling power to their show windows. They know a window with a high intensity of light attracts more people to it than one with a low intensity by as much as 70 per cent.

This percentage figure is variable but it is a recognized average. Many merchants, especially the larger ones, place a dollar-and-cent value on

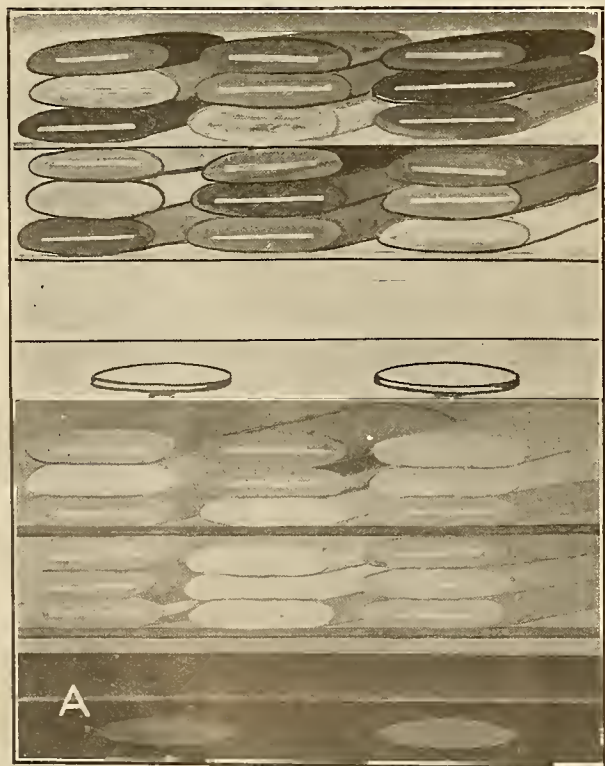


Fig. 5. The light goods department of a store seems brighter because the light goods reflect more light. Fig. 5a. With the same amount of light falling upon them as in Fig. 5, dark goods will reflect much less light and therefore require more.

their windows. The added percentage of pulling power by light is in direct proportion to the dollar-and-cent value; that is, a window with a value of \$100 per hour, with a low amount of light, when changed to a greater amount has an added pulling power of 70 per cent, now giving it a value of \$170 per hour.

Color lighting is now being recognized as having an added value when properly used for displaying merchandise in show windows. The simple arrangement of strips of colored ribbon, shown in Fig. 6, serves to demonstrate this very well. These strips of ribbon are white, green, orchid, purple, and light blue, from left to right. With a red light upon them, the white changes to red, the green to black, the orchid to a light red, the purple to a deep red and the light blue to silver. With a yellow light upon them, the white becomes yellow, the green remains green, the orchid becomes pink, the purple an orange-red, and the light blue a green. With a green light upon them, the white becomes green, the green remains green but is darker, the orchid becomes a gray, the purple a reddish black, and the light blue a gray.

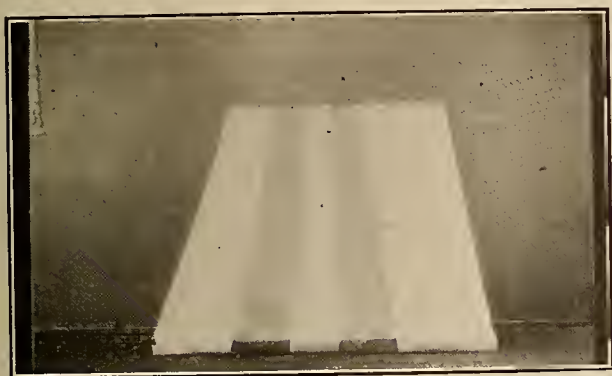


Fig. 6. The colored ribbon board, when seen under different colors of light, seems to change into different colored materials.

A knowledge of pigment colors and light colors permits us to use both of them to the greatest advantage in the show-window, even to the background.

Keeping Home Lights Burning Rightly

Color also comes in for its share of consideration in the home. Here there is no limit to how far a skilled designer may go in producing pleasing and unusual effects by the control of high lights, shade, and color.

We find, however, there are as many different ideas on design, color harmony, and like items, in the home as there are individuals who control the home. One consideration which always should be emphasized in the home is that illumination should be soft and free from glare. All lamp bulbs should be shaded. From there on, personal tastes may be the guide. Occasionally, however, we find decorations and furnishings which have been selected for their rarity, or possibly their beauty, destroyed by artificial light. The beauty of such furnishings and decorations is enjoyed only during daylight hours. It should be enjoyed equally under artificial light, and can be if some consideration is

given the lighting condition surrounding the furnishings, for artificial lighting may be used as a decorative medium or merely as an ornament.

Consider the case of a floor lamp typical of those in many homes of today, with red shade and red globes. Let us assume for a moment this



Fig. 7. The interior of the home needs care in lighting. Use a clear light or light tint for general illumination and colored floor lamps for decoration.

lamp in a room where because of its beauty a mulberry floor covering has been selected. Likewise, for its harmony with the color of the rug, together with its comfort, we will assume blue mohair furnishings; again, assume a neutral tone wall covering.

If we were to bathe our room in the red light of the floor lamp, the mulberry rug becomes a red rug. The blue furniture pieces become black, and the wall is bathed in red. The original design of the room has been destroyed. (Fig. 7 shows room arrangement.) This need not be. Let the floor lamp be used as a reading lamp, or as an ornament, and let the room be bathed in clear light which does not destroy our room design. A tinted light may be desirable and often may be used.

I hope these demonstrations have given each of you something. For me, I am one of the workers of artificial light, the light that man controls, the torch of civilization's march onward.

A great writer once said, "Blessed is the man who has found his work," and plainly thought that the greatest blessedness. We have most of us heard these sentences, but probably thought they were meant only for artists or people like that. But that is not so—it's for you and for me—and this is my work.

Denver Would Regulate X-ray Machines.—Finding that the supervisor of radio of the Department of Commerce has no power to regulate radio interference caused by high-frequency electrical machines such as X-ray or violet ray, the city council of Denver recently called upon its attorney to draw up an ordinance providing for such regulation. This is believed to be the first attempt on record to regulate such apparatus with respect to radio reception. The regulation of the high-frequency apparatus, it was stated, probably would take the form of prescribing certain shielding requirements which are claimed to eliminate the trouble.

Electric Heating in the Modern Home

By H. E. Sandoval

Sandoval Sales Company, San Francisco

FOR the past three decades a person was considered as having an electric home first, when he had his home wired for electric lights; second, when he installed lamp-socket appliances such as the electric iron, vacuum cleaner, washing machine, and similar equipment, and third, when he added the electric range.

Today a person does not have an electric home unless all energy for lighting, heating, cooking and power purposes is received through the electric meter and one bill from the electric company covers everything.

The equipment in this home consists of 110-volt lamps and fixtures, 110-volt appliances, such as toasters, waffle irons, cleaners, and the like, an electric range, an electric water heater, large-capacity electric air heaters (1,000 to 6,000 watts), an electric ironer and an electric refrigerator.

The wiring consists of a heavy 3-wire 110-220-volt main service, usually 3 No. 2 wires; 110-volt lighting circuits; 110-volt appliance outlet circuits; a 3-wire 110-220-volt range circuit; a 220-volt water heater circuit, and a 220-volt circuit for each heater or heating device over 660-watt, capacity.

Before going further it is well to state that the all-electric home is made possible by a favorable combination of two factors, namely, climatic conditions and low rates for electric energy. This article has to do primarily with climatic conditions as found in California, and a combination lighting and heating rate for electricity in that territory for an eight-room house, as follows:

First 30 kw-hr. per month at 7c.

Next 150 kw-hr. per month at 3½c.

All over 180 kw-hr. per month at 2c.

A yearly minimum of approximately 50 cents per month per kilowatt of connected load is in effect.

In an average home of eight rooms or less 30 kw-hr. ordinarily covers the lighting, 150 kw-hr. covers the cooking, and the heating is considered as being carried on a 2-cent rate.

The most important thing regarding the all-electric home is the cost of operation, and it is interesting to know that there are many homes of from five to eight rooms using from \$200 to \$300 of electricity per year. This is put on a yearly basis rather than monthly on account of the heating. This amount is divided about as follows:

THE electric home today is not complete unless all energy for lighting, cooking and heating is received through the electric meter. In this article the author specifies the equipment for this new electric home and gives some pointers on how the industry can better sell it to the public.

Electric lighting and appliances, \$30 per year. Electric cooking, \$60 per year. Electric water-heating, \$60 per year. Electric heating, \$50 to \$150 per year. Making a total of \$200 to \$300 per year.

Compare this with the ordinary home, and for this purpose the following figures should be adjusted to local rates and prices:

Electric lighting and appliances, \$30 per year. Gas cooking, \$25 per year. Gas water heating, \$50 per year. Heating (coal and wood), \$75 per year. Making \$180 per year.

Most people see only the fuel item which enters into the cost of operation of a home, whereas this is only one of several, and sometimes not the most important. The items contributing to the total cost are as follows:

1. Interest and taxes on first cost of equipment.
2. Maintenance of equipment.
3. Depreciation of equipment.
4. Labor necessary to operate.
5. Fuel or energy.
6. Health and safety.
7. General desirability.

Tangible values can be placed on the first five factors and electricity is the lowest of all, except 5 (fuel), which is practically the entire cost. However, there are certain intangible values in the last two items which often prove the deciding factor for electricity. When the sum total is taken it will be found that the electrical home is just as economical as any other and far more desirable.

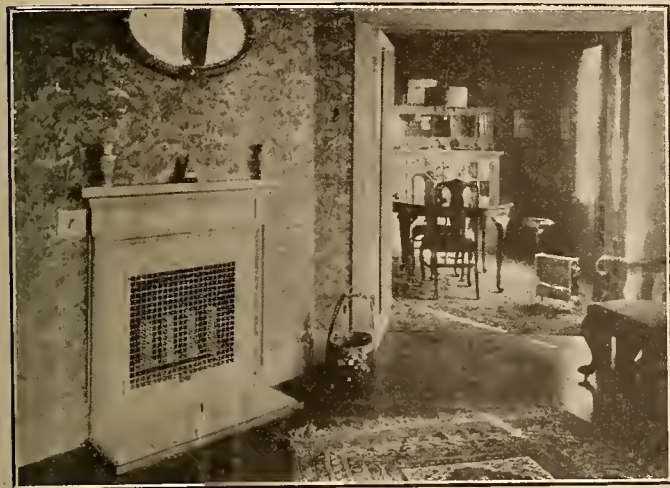
The all-electric home appeals primarily to that family in moderate circumstances which is buying its own home and where the wife with a couple of kiddies to look after is doing her own work. A servant is expensive and hardly can be considered, but a few extra dollars for electrical servants produce most satisfactory results and prove far more economical and dependable.

Electric cooking has made such rapid progress during the last few years that it has become an accepted fact by most progressive housewives, and it is only a question of time and opportunity when the electric range takes its place in the kitchen. Housewives have come to know that it really costs nothing to operate an electric range, for the savings in time, labor and food more than pay the electric bill.

Not so much is known of electric water-heating

and electric air-heating by the public and these, although just as meritorious, require a little more educational work before they are used universally.

With electricity at 2 cents per kw-hr., the cost of operation is the dominating factor in electric water-heating and practically determines the type of equipment used. Intermittent heating is the



Electric heating is essential in the modern home electric.

cheapest method of heating water, as radiation losses are minimized and less hot water is used than where a supply of hot water is available at all times.

An external circulation type of heater banks the water at the top of the boiler where it can be drawn off readily after the heater is started. A 5-kw. heater is the most popular on account of its speed in intermittent heating. All boilers and pipes should be lagged thoroughly which minimizes radiation losses and tends to keep the tank hot after the heater is turned off.

Heaters should have an automatic thermostatic cut-out as insurance against heater burn-outs and fire hazard. Such a thermostat also permits of turning the heater on and automatically maintaining a tank of hot water.

In the ordinary home of from five to eight rooms it has been found that intermittent water-heating takes from 150 to 250 kw-hr. per month, which at a 2-cent rate, amounts to \$3 to \$5. Where the water in a tank automatically is maintained hot and a hot-water service is always available, the consumption just about doubles, namely, 250 to 500 kw-hr. per month, or \$5 to \$10. This is due to increased radiation losses and increased use of hot water. This service is most satisfactory, but in competition with gas at \$1 per 1,000 cu. ft. it proves more costly.

In order to compete, an auxiliary tank has been developed which provides a limited hot-water service continuously without heating the main tank. This tank takes care of all ordinary wants, such as cooking, dish-washing, and similar uses, and when large amounts of water are required the main tank is heated by opening a valve. The service is quite satisfactory, and the consumption varies from 200 to 300 kw-hr. per month, which places it on a par with competitive heating.

Water heaters which are well designed and constructed are fairly free from burn-outs and require little service over a long life.

Selling electric air-heating in the home at first meets with resistance from consumers on account of previous experience with lamp-socket (660-watt) heaters. They have used these heaters on lighting rates and have failed to get sufficient heat but have received high bills for electricity.

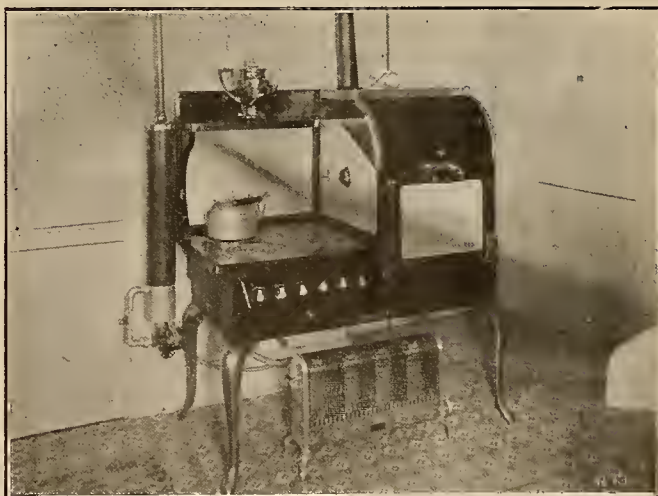
The 660-watt radiant heater has a very definite field and when properly sold gives most satisfactory service. It is not intended to heat a room any more than a pocket flashlight is expected to light a room. Both give an intense beam over a limited area only. For spot heating, the radiant heater proves very satisfactory but for raising the temperature of any but the smallest rooms it is necessary to have heaters of 2 to 6,000-watt capacity.

Heat may be classified under two general headings—radiant heat and convection heat. A high-temperature mass gives off radiant beams which pass through air without heating it but heats solid objects upon striking them. The rays from the sun are examples of this.

Air passing over or coming in contact with a hot mass at comparatively low temperatures absorbs heat and rises and this is known as convection heating.

With radiant heat, the solid objects in the room are at a higher temperature than the air and heat it. With convection heating the air is at a higher temperature than the solid objects and heats them by contact. It readily may be seen, therefore, that for raising the room temperature convection heat is more effective than radiant heat.

Practically all electric heaters use one principle or the other or a combination of the two, which



Electric water heater, range and air heater are part of the modern kitchen.

seems the most desirable. A radiant convection heater dissipating the bulk of its heat by means of convection air currents but giving off a small amount of radiant heat for quick heating and coziness has proved most satisfactory.

There are four essential features to a good electric heater for room-heating in the home. (1) It

should have a comparatively small amount of radiant heat as explained above. (2) It should contain as little mass as possible in accordance with good construction. The greater the mass, the greater the amount of heat stored in the heater that is not immediately available for heating the air. (3) The heater should operate at a sufficiently low temperature so that the dust particles in the air will not be scorched and burned, thereby soiling the walls and ceiling. (4) The heater should be so constructed as to require little maintenance and have long life.

It is customary to install a heater in each room of such a size as to give a comfortable temperature on the coldest winter days. There are few extremely cold days, and it follows that for the average winter day the heater is larger than necessary.

Heaters are all equipped with three heats so that they may be turned down to meet any condition. The large heater also has the feature that, when a cold room is entered the appliance may be turned on full heat for a few minutes which will rapidly raise the temperature, and after that it can be turned to a lower heat.

With a difference in temperature between the outside and inside of a room, a definite heat transfer takes place from the walls, floor and ceiling, and it is necessary to supply that amount of heat to the room. With ordinary good construction in a house, $1\frac{1}{2}$ to 2 watts per cu. ft. will produce a temperature rise of about 30 deg. F.

Electric heat is flexible and available in just the quantity desired at all times. One or all the rooms in a house may be heated as required. Automatic heaters will maintain even temperature, doing away with extremes of heat and cold. A hall heater usually will keep the chill off the entire house.

Portable heaters may be moved to suit the housewife's convenience, or stationary heaters may be installed in the walls where they are out of the way and take up little space.

One of the big advantages of electric heat is the elimination of flame and combustion with its consequent fire hazard, and the labor and dirt that go with it. This is of considerable importance in the home with small children where health and safety are paramount.

Electric heaters also are used with furnace installations for those chilly fall and spring days when it is uneconomical and bothersome to start a furnace for just a few minutes but uncomfortable without some heat.

There are many advantages to the all-electric home but it seems unnecessary to enumerate them. The public generally accepts the electric home as better and more desirable than any other, but is dubious as to the operating cost. In this article I have endeavored to show how, all things considered, the electric home is just as economical as others less desirable. A comparable illustration is this—the cost of kerosene for lighting is less than the cost of electricity, but the almost universal use of electricity for lighting where available would indicate that electric lighting is more economical than kerosene lighting when fuel, labor, maintenance,

fire hazard and similar factors are taken into consideration.

It is simply a matter of education, and before long in certain sections of the country the electric home will predominate. Most people are "from Missouri" and they are rapidly being "shown." At present the electric home is making most rapid progress where the housewife is doing her own work and looking after a couple of kiddies. To her it is a source of pride and the greatest labor-saver possible.

There are others to whom the electric home represents something "better," and they are willing to pay a little more for comfort and convenience. The first cost of building an all-electric home is usually less than that of a similar home of different type, and after a year's operation, much to their surprise, the owners generally find that they have saved money.

To summarize, the following question might be asked: "What does the all-electric home mean to industry?" To the contractor it means a wiring job of from \$150 to \$300, instead of \$50 to \$75 as at present; to the dealer it means the sale of \$200 to \$500 of equipment which would otherwise go into other channels; to the electrical jobber and manufacturer it means additional sales of from \$200 to \$400 per home; to the power company, a revenue of from \$200 to \$300 per year, instead of \$30. Last, but not least, to the consumer it means comfort and convenience at reasonable cost.

Utilities Commission Cannot Fix Community Boundary

A recent decision rendered by the Colorado supreme court ruled that the public utilities commission of that state exceeded its authority in attempting to fix a boundary around a given community, outside its corporate limits, within which boundary a utility could not operate.

The case in question was that of the state vs. James Pirie and the Clear Creek Power & Development Company. In 1923 Mr Pirie applied to the Colorado Public Utilities Commission for permission to furnish light and power to Idaho Springs under a franchise he held. The application was denied on the grounds that the Colorado Power Company, now a part of the Public Service Company of Colorado, already was serving the community and that the prior rights of that company must be respected. However, the commission also denied the Clear Creek company the right to extend its lines "into the Idaho Springs district." The lines were run into the town of Dumont, near Idaho Springs, and the commission through the district court sought an injunction against Mr. Pirie and the Clear Creek company. The injunction was denied.

The district court ruled that while the commission was within its rights in denying Mr. Pirie the right to extend service lines into Idaho Springs it was not legally justified in defining the limits of the Idaho Springs district.

Constructive Co-operation

By Lester S. Ready

Chief Engineer, Railroad Commission of the State of California

THE duty and obligation of the public utilities of the state is to render good service, continually improving service, at reasonable charges to the public. The main object of the utilities activities, to their owners, is to make a fair and continuing profit on their property through the rendering of satisfactory service to the public. Under regulation the speculative feature which exists in other enterprises practically is eliminated, competition with its duplication of capital and unproductive activities in most cases is removed and the utilities' business becomes primarily that of efficient construction and continuous operation.

A careful analysis and observation of utility service brings out the fact that it is not possible fully to obtain by regulation the natural urge for improvement of service and efficiency that is obtained under active competition. However, there are many advantages gained under regulation that more than offset this disadvantage. Duplication of capital and expense is eliminated. Efforts of the utility's staff can be directed to constructive work and away from duplication existing under competitive conditions. The greater assurance of continued usefulness of investment and dependability of operation makes possible greater standardization, uniform public treatment, more permanent development and construction and, if correctly guided, a concentration of effort toward efficiency and service. The necessity of retaining trade secrets from other like utilities vanishes. Not having direct competition nothing is gained by the failure to discuss frankly improvements that have been developed. In fact much is lost to the utilities and to the public if such is not done.

It is to the general advantage of all utilities and likewise to the advantage of the public served that there be free exchange of ideas and experiences between utilities. Each utility has certain practices and methods which are an improvement over those of other utilities. Free exchange of ideas, plans and experiences makes possible the application of more efficient and modern methods to the service of the entire territory together with reduction in cost and improvement in efficiency. It stimulates in the staff of the several utilities a greater interest in their work and that healthy competition of effort that is

"A VITAL and integral part of the scheme of public utility service under regulation is the consistent pursuit of inter-company consultation between technical staffs of the various utilities." Thus does Mr. Ready characterize this phase of utility activity. He gives some interesting information and draws some interesting comparisons in support of his view.

free of duplication. Competition for business between utilities with its duplication of investment and expense is supplanted by competition of brains. Through the medium of various technical and other sections of the associations this healthy and constructive competition is fostered with practically no duplication of expense and is a great urge for efficiency. The competition of the staffs of the different companies in the submitting of improvements and the

showing of their utility to be leading in the development of the art does much to maintain a continually improving service.

Inter-company Consultation

A vital and integral part of the scheme of public utility service under regulation is the consistent pursuit of inter-company consultation between the technical staffs of the various utilities for the constructive development of business, the improvement of service, greater safety, increase in efficiency, and for a better understanding with the public. I consider its non-existence would represent a failure on the part of utilities in their responsibility to the public. Freed in the main from competition they cannot rest but must in the progress of our day keep pace with or even lead in the development of their industry.

In the twelve years of observation and investigation of utilities I have seen many good ideas and practices generally applicable to the service of the entire state which have been limited to small fields of usefulness because they have not been more widely known. In the past these useful ideas have been more or less buried even as many men of real talent sometimes are lost in large organizations. The progressive utilities have put into effect their personnel departments to bring out and develop the men capable of larger fields of usefulness. The larger utilities have their engineering committees for the exchange of ideas within the company for the improvement of its service. Constructive, co-ordinated interchange of ideas on a business basis is only a forward step in the advance of industries.

The more progressive electric utilities recognize the value of the interco-operation outlined in the preceding paragraphs and are making a bus-

iness of inter-company consultation through the various technical sections of their associations. In these cases a free exchange of ideas and experiences together with a frank discussion of operating problems has done, is doing and can continue to do much to improve electrical service to the public.

Other Utilities Have Similar Practice

Utilities other than the electric utilities also have gone to a great extent in making a business of constructive inter-company consultation and joint research. Much of the great success in the telephone communication service that we have today is due to the diligent pursuit of joint research, co-ordination and development. The nature of the telephone business has made this necessary earlier than with other utilities. The formation by the American Telephone & Telegraph Company, which controls the majority of the telephones of the nation, of a national research and development organization for the benefit of all of the main telephone utilities in the United States has done much for the benefit of the public in the way of good service. In this organization, which is supported through charges to the associated companies, the exchange of operating experiences and research for the entire national system is carried on. Interchange of ideas and research were placed upon a business basis.

Ten or fifteen years ago the gas utilities were considered to be in danger of retrogression. Some predicted that they were becoming obsolete, inadequate, and would be superseded by other forms of service particularly electric service. One of the difficulties was that progress and development were almost at a standstill. The industry was old compared with the electrical industry. Regulation was not easily accepted; the urge to progress under regulated monopoly had not developed. A frank and open exchange of ideas and thoughts between the different utilities did not exist in a healthy way. In fact in some sections there seemed to be more misinformation exchanged than facts. As a result this business was tending toward decadence. In the last ten years a different condition has developed. It has been realized that the future of the gas industry depends upon a co-ordinated constructive working out of the various problems by getting together for frank discussion of the problems of that industry.

The gas companies of California in the past five years have joined together in a definite program of constructive co-operation by making a business of the interchange of ideas and the co-ordination of research under a joint research council supported by the utilities. They have formed a consulting board for all of the utilities, consisting of the best technical brains of the gas industry of the state, where problems are discussed and where research into the operating difficulties of the companies are outlined and co-ordinated. As a result the utilities today have a State Gas Consulting Board which is of material benefit to the public utilities and the public throughout the state. The results of this wholehearted, frank and open dis-

cussion of problems between these utilities, directly from the research carried on and indirectly through the more enthusiastic efforts which have been developed within the utilities in the improving of their service, have been worth much more than the cost. The gas utilities are far from being in a decadent condition. Their growth in California has been almost as spectacular as that of the electrical industry. Their service is so greatly demanded that it taxes the ability of the utilities to meet the requirements. Further, the companies are prosperous. It is not claimed that the co-ordination of effort in this state and other parts of the country has been the whole cause of this great change of conditions, but it has been an important contributing factor.

Southern California Edison Customer-Owners Now Number 85,639

DURING 1925 the Southern California Edison Company sold to the public under the customer-ownership plan capital stock of a par value of \$24,822,400. The number of new stockholders secured during the year was 17,239, and the actual cash receipts from stock sales amounted to \$23,697,780.20. The major portion of the new stockholders are consumers of the company residing in southern California.

In excess of 10,000 of the new customer-owners were secured through the efforts of the Hundred Thousand Club, an organization of Edison employees (see Journal of Electricity, Oct. 1, 1925, p. 242).

Since the customer-ownership plan was put into effect by the Edison company in 1917, the number of new stockholders has been increased from 1,864 to a total at the close of 1925 of 85,639. The par value of the stock sold during this eight-year period is \$85,910,200, and cash receipts on account of these sales have been \$78,116,487. The following table shows the year-by-year sales since 1917:

Year	No. of Stockholders Acquired	Par Value of Stock Sold
Prior to 1917	1,864	
1917	1,988	\$3,114,600
1918	185	181,900
1919	3,349	4,609,300
1920	181	867,400
1921	19,161	17,280,100
1922	21,749	14,562,000
1923	17,529	6,000,000
1924	2,394	14,472,500
1925	17,239	24,822,400
Totals	85,639	\$85,910,200

Plans for 1926 call for the addition of at least 20,000 new stockholders, with the customer-ownership program under the direct supervision of R. H. Ballard, vice-president and general manager of the Edison company. That expectations will be reached is indicated by the customer-owner sales for January, which were in excess of \$3,000,000.

Tests on Steel and Wood Poles*

Part 1—Steel Poles

In submitting this report it is desired first to give recognition to the fact that the studies of previous subcommittees have furnished the basis from which the present subcommittee worked.

At this point it is well to say that the wood pole still has its field of usefulness in supporting overhead lines of all descriptions. It is believed, however, that the steel pole has entered the field in competition with the wood pole. At the present steel poles are used only for the support of circuits of prime importance or where special conditions make the use of wood poles not feasible. Two factors are expected to be prominent in advancing the general use of the steel pole. These are, first the growing scarcity of wood poles of satisfactory quality and their constantly rising cost and, second, the decrease in steel-pole costs as designs are standardized and greater quantities are used.

The purposes of this first section of the report are:

1—To suggest possible standard requirements for the design of steel poles to meet the four loadings shown in Table I.

2—To furnish two proposed standard designs of steel poles, together with estimates of cost, these poles to conform to the so-called light-loading for certain California areas as specified in General Order No. 64 of the Railroad Commission of the State of California. It is not the committee's idea that these two poles shall satisfy all possible needs, but that they shall provide a definite basis from which to work up necessary designs in standardized poles.

Advantages and Disadvantages

The advantages and disadvantages of steel poles have been discussed in previous reports and they will be only summarized here. Briefly they are as follows:

Steel Poles

Advantages: 1. Practically permanent. (Unaffected by fire, decay, and animal destroyers.) 2—Stronger. (Fewer poles per mile.) 3—Lower maintenance expense. 4—Smaller annual depreciation charges.

Disadvantages: 1—Higher initial cost installed. 2—Easier for unauthorized persons to climb. 3—More difficult to work on and increased danger of linemen if worked on while the line is alive.

Steel Crossarms

Advantages: 1—Practically permanent. 2—Stronger. 3—Lower maintenance expense. 4—Smaller annual depreciation charges.

Disadvantages: 1—Higher initial cost installed. 2—The principal disadvantage is the danger of the shorting of lines by birds when using pin-type insulators. This objection is eliminated when suspension-type insulators are used. 3—Less flexible for general application.

Protection Methods

Several features have been suggested for the protection of men working on distribution lines on steel poles. These are suggestions only, and no recommendation is made other than that this feature be given consideration by future committees. The suggested

TABLE I.—Conductor loadings

Type of loading	Radial thickness of ice, inches	Wind Load on Projected Diameter, Lbs. per sq. ft.
Heavy.....	$\frac{1}{2}$	8
Medium.....	$\frac{3}{4}$	8
Light.....	None	12
Light.....	None	8

TABLE II.
DATA ON POLES

ITEM	TYPE A			TYPE B		
	Battered Pole Earth Fig.	Conc. Fig.	Vert'l Pole Conc. Fig.	Earth Fig.	Conc. Fig.	Earth Fig.
Height—above ground.....	53ft. 6in.	53ft. 6in.	53ft. 6in.	57ft. 0in.	57ft. 0in.	57ft. 0in.
—overall.....	61ft. 6in.	61ft. 6in.	60ft. 6in.	65ft. 0in.	64ft. 0in.	64ft. 0in.
—to low wire.....	40ft. 0in.	40ft. 0in.	40ft. 0in.	43ft. 6in.	43ft. 6in.	43ft. 6in.
Conductor Separation—						
Between Circuits.....	11ft. 0in.	11ft. 0in.	11ft. 0in.	11ft. 0in.	11ft. 0in.	11ft. 0in.
Between Phases.....	6ft. 0in.	6ft. 0in.	6ft. 0in.	6ft. 0in.	6ft. 0in.	6ft. 0in.
Weights of Pole (without arm and including $\frac{3}{8}$ in. Min. Material).....	1,935 lb.	1,460 lb.	1,600 lb.	2,530 lb.	2,050 lb.	95 lb.
One suspension arm.....	125 lb.	125 lb.	125 lb.	125 lb.	125 lb.	125 lb.
One Pin-Type Arm-Pipe.....	220 lb.	220 lb.	220 lb.	220 lb.	220 lb.	220 lb.
Stubs in Concrete.....	310 lb.	345 lb.	345 lb.	345 lb.	345 lb.	345 lb.
Earth Fig. $\frac{1}{2}$ in. Min. Mat'l.....	780 lb.	780 lb.	780 lb.	905 lb.	905 lb.	905 lb.
— $\frac{1}{2}$ in. Min. Mat'l.....	940 lb.	940 lb.	940 lb.	1,010 lb.	1,010 lb.	1,010 lb.
Alternate Pac. Co. Std. Co. Fig. $\frac{1}{2}$ in. Min. Mat'l.....	680 lb.	680 lb.	680 lb.	825 lb.	825 lb.	825 lb.
— $\frac{1}{2}$ in. Min. Mat'l.....	820 lb.	820 lb.	820 lb.	905 lb.	905 lb.	905 lb.
Total Weight (Assuming Pipe X-Arms for Type A and $\frac{3}{8}$ in. Min. Mat'l).....	2,310 lb.	1,835 lb.	1,975 lb.	2,815 lb.	2,335 lb.	1,750 lb.
Concrete—Cu. Yds.....	1.75	1.75	1.16	1.75	1.75	1.75
Estimated Cost of Erected Pole not including insulators.....	\$160.00	\$165.50	\$162.00	\$190.50	\$195.50	\$195.50
Cost of Insulators and Hardware.....	46.00	46.00	46.00	94.00	94.00	94.00
Cost of Completed Poles.....	\$206.00	\$211.50	\$208.00	\$284.50	\$289.50	\$289.50

Notes:—1—Wts. include 2½% for galvanizing.
2—Suspension Insulators for Type B poles.

TABLE III.—Insulator Ties

Size Wire	Initial Tension (Lb.)	Size Tie Wire B. & S. Gauge	Kind of Tie Used (All ties 5 turns each)	Final Tension (Lb.)	Amt. of Slip (inches)	Remarks
1/0.....	1,125	6	Std.	220	5 1/4	1/2 span 250 ft.
1/0.....	1,175	6	Std.	150	9 1/4	1/2 span 250 ft.
1/0.....	1,150	6	Std.	170	8	1/2 span 250 ft.
1/0.....	1,150	6	Std.	325	5	1/2 span 250 ft.
1/0.....	1,150	6	Std.	230	7	1/2 span 250 ft.
1/0.....	1,150	6	Cross	400	3 1/2	1/2 span 250 ft.
1/0.....	1,150	6	Cross	150	8 1/2	1/2 span 250 ft.
4/0.....	2,310	4	Std.	850	2	1/2 span 200 ft.
4/0.....	2,340	4	Std.	850	2 1/2	1/2 span 200 ft.
4/0.....	2,510	6	Std.	300	4	1/2 span 200 ft.
4/0.....	2,160	6	Std.	900	2	1/2 span 200 ft.
4/0.....	2,410	6	Cross	850	2 1/4	1/2 span 200 ft.
4/0.....	2,410	6	Cross	230	10 1/4	1/2 span 200 ft.

Note:—Procedure of test:
(a) Wire pulled up to normal stringing tension.
(b) Tie made on wire at insulator.
(c) Wire released suddenly at one end.
(d) Final tension read on dynamometer at other end.

TABLE IV.—Formula for working loads
(Values given in lb. per sq. in.)

Stresses	Structural Grade Steel (Strength of Materials Subcommittee Values)	High Elastic Limit Steel (P. G. & E. and So. Cal. Ed. Values)
Compression.....	$\frac{22,000-67}{R}$	$\frac{30,000-110}{R}$
Maximum Tension.....	22,000	30,000
Bolts—Shear.....	24,000	24,000
Bolts—Bearing.....	48,000	48,000
Rivets—Shear.....	20,000	20,000
Rivets—Bearing.....	30,000	30,000

* Serial report of pole subcommittee of the overhead systems committee, P.C.E.A. (Prepared by 1924-5 subcommittee, but publication delayed.) E. H. Steele, Pacific Gas and Electric Company, chairman; R. G. Boyles, Southern California Edison Company; J. M. Brady, J. H. Baxter Company; S. M. Bullis, California Oregon Power Company; C. B. Carlson, Southern California Edison Company; L. J. Corbett, Pacific Gas and Electric Company; Walter Dreyer, Pacific Gas and Electric Company; A. S. Glasgow, San Diego Consolidated Gas & Electric Company; P. W. Greenleaf, Southern Sierras Power Company; G. H. Hagar, Great Western Power Company; F. G. Hamilton, Southern California Edison Company; G. E. Honn, Pacific Coast Steel Company; H. E. Luce, Truckee River Power Company; F. D. Morgans, Southern Sierras Power Company; H. D. Nesbit, San Joaquin Light & Power Corporation; C. W. Osborne, St. Helens Cressotting Company; G. A. Riley, Los Angeles Gas & Electric Corporation; H. G. Sharpe, Pacific Coast Steel Company; C. W. Walker, Ontario Power Company; C. E. Young, Pacific Gas and Electric Company.

methods are: 1—Insulation of the pole from the ground. (This would apply up to about 4 kv.) 2—Protective insulator shields attached to pole. 3—Insulating shoes to be used in conjunction with insulating gloves. 4—Sectionalizing switches for killing the portion of the line to be worked on. 5—Insulated tools for working lines alive, such as described in H. H. Minor's report on the "testing of high-voltage in-

sulators in service." (Journal of Electricity, June 1, 1925, page 437.) 6—By means of a portable insulated platform.

Design of Steel Poles

The conductor loadings used in the design are listed in Table I.

The characteristics of the various types of conductors in use throughout the United States, together with the loading per linear foot of wire for either of

the conditions readily can be obtained from the tables of the Overhead Handbook of the National Electric Light Association. No attempt will be made to include any of these data in this report.

After a great deal of preliminary study had been made it became evident that it would be impossible to design one pole which would meet all conditions and still remain reasonably economical. It was decided, therefore, to design two general types of poles to meet the conditions.

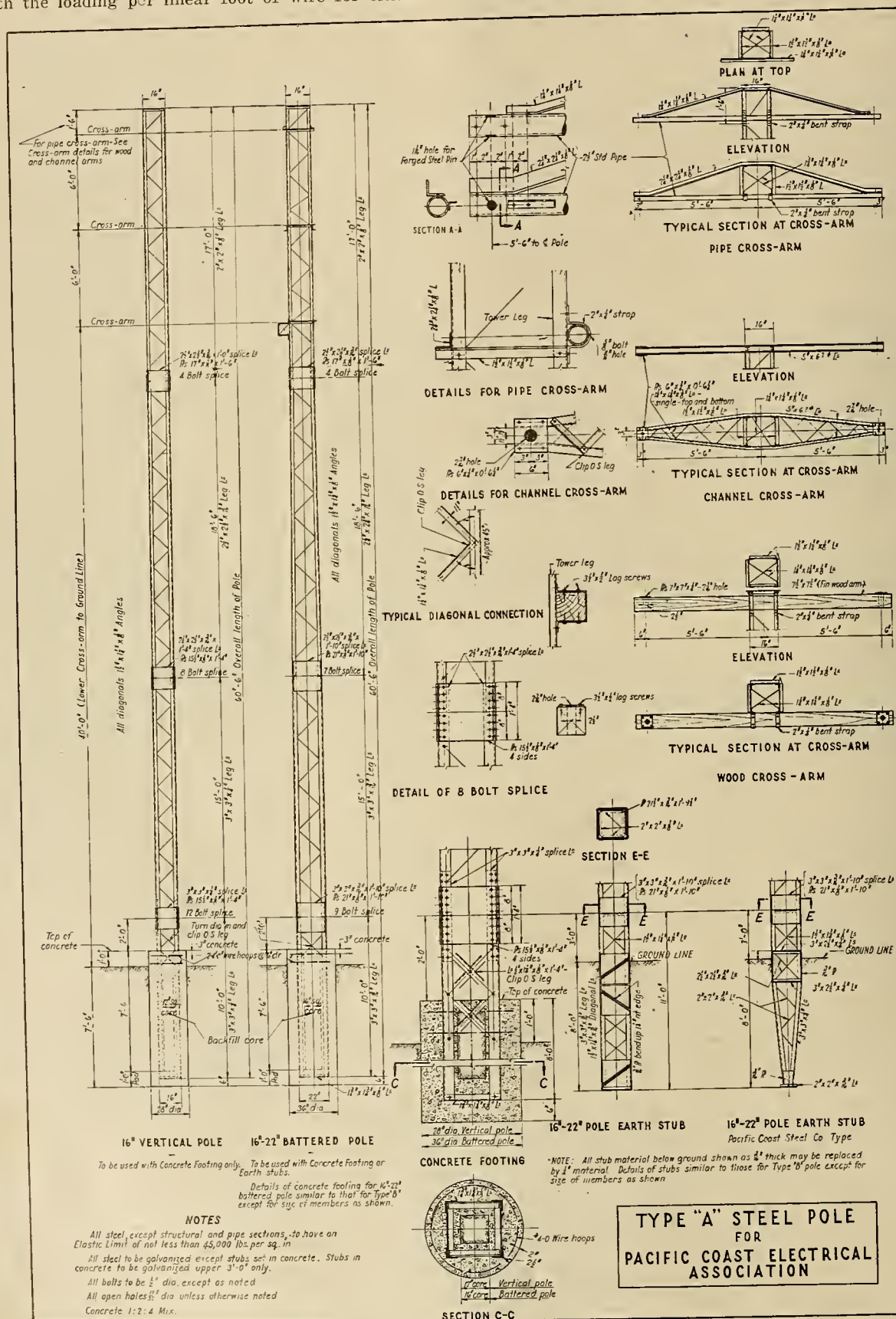


Fig. 1. Design details of light-weight steel pole to meet light-load requirements of California Railroad Commission.

The lighter pole (Type A) is designed for the combination of the following loads simultaneously applied:

- 1—A transverse load due to an 8-lb. wind on six No. 4/0 bare stranded copper wires on a span of 450 ft. (160 lb. per wire.)
- 2—A 13 1/3-lb. wind pressure on the area of the pole itself, corresponding nearly to a load of 325 lb. applied at the top of the pole.
- 3—A longitudinal pull in the direction of the line

of 700 lb. applied at the end of any crossarm. This pull is the minimum strength requirement for cross-arms and conductor fastenings required in paragraph 62 of General Order No. 64 of the California Railroad Commission.

4—A vertical load at the end of all crossarms of 640 lb. corresponding to the vertical component of 900 ft. of wire plus weight of insulators. This is an average value, but in the case of the line following very steep slopes the actual maximum condition should

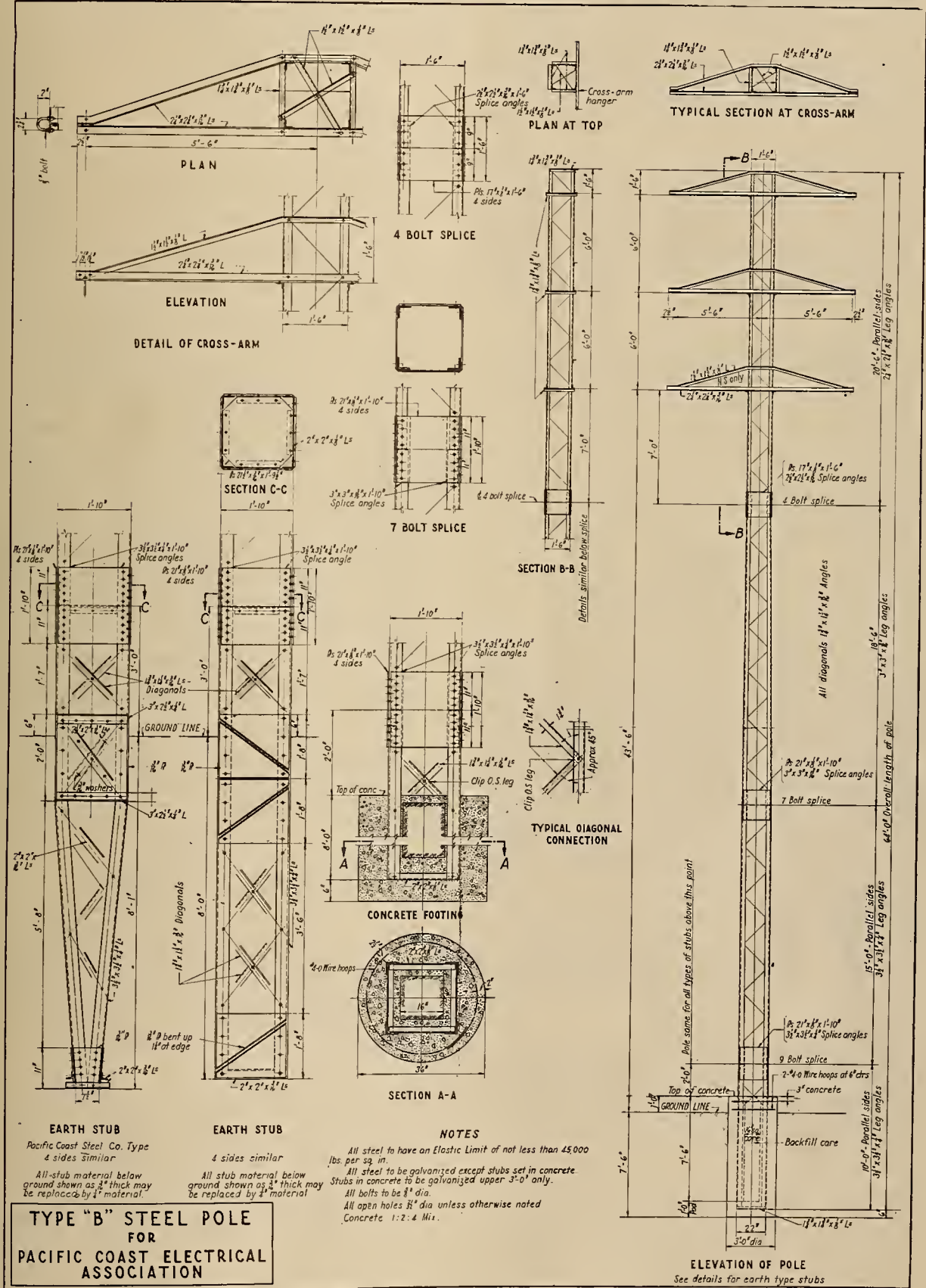


Fig. 2. Design details of steel pole to withstand loadings heavier than outlined for the type A pole.

be investigated and the strength conditions of the pole further studied.

The heavier pole (Type B) is designed for the combination of the following loads simultaneously applied:

1—A transverse load due to an 8-lb. wind on No. 4/0 bare stranded copper wire on a span of 450 ft. (160 lb. per wire.)

2—A $13\frac{1}{3}$ -lb. wind pressure on the area of the pole itself, corresponding nearly to a load of 360 lb. applied at the top of the pole.

3—A longitudinal pull in the direction of the line of 1,500 lb. applied at the end of any crossarm. This load would occur in service in the event of one No. 4/0 wire breaking when supported by a five-unit suspension insulator string. The maximum stress in the wires would be 2,400 lb., but this would be reduced to 1,500 lb. by the suspension insulator swinging into and becoming part of the catenary when a wire is broken.

4—A vertical load at the end of all crossarms of 640 lb., corresponding to the vertical component of 900 lb. of wire plus weight of insulators. This is an average value, but in the case of the line following very steep slopes the actual maximum condition should be investigated and the strength conditions of the pole further studied.

On May 8, 1925, a series of tests was made to determine the amount of load that a standard slip-tie

TABLE V.—Ultimate Shear and Bearing Values for Bolts
(Values given in lb. per sq. in.)

Test made by	DIAMETER OF BOLT			
	$\frac{1}{2}$ Inch	$\frac{3}{4}$ Inch	$\frac{1}{2}$ Inch	$\frac{3}{4}$ Inch
Elec. Bond & Share Co.	Shear	Bearing	Shear	Bearing
Min. Values	40,000	87,600	40,100	97,000
Max. Values	62,000	102,000	60,800	111,000
Bethlehem Steel Co.				
Min. Values	42,800		42,100	37,500
Max. Values	54,500		48,200	49,700
American Bridge Co.				
Min. Values	33,400		33,500	
Max. Values	36,300		37,300	
Pac. Gas & Elec. Co.				
Min. Values	39,800	119,000		
Max. Values	48,000	146,000		
Pac. Coast Steel Co.				
Min. Values	41,500	96,000	49,500	75,000
Max. Values	51,000	100,000	52,000	84,000

made on 60-kv. pin-type insulators would hold if the line, after being pulled to tension, was released suddenly, relying entirely upon the tie to take the shock thus applied. These tests were for the purpose of determining what loads any structure might be called upon to withstand when supporting any given size conductor fastened to pin-type insulators by the standard tie made with No. 6 and No. 4 B&S gage soft-drawn copper. The standard tie here referred to is a tie which is meant securely to fasten the conductor to the insulator. However, it is not meant to be used as a cinch tie to take on any dead-end loads. Experiments have shown that several methods of making the standard slip tie could be used and practically the same loading results obtained.

Table III shows the results of these tests which are of particular interest, especially in the design of steel-pole structures.

For both the type A and the type B poles the loadings given in the preceding paragraphs represent safe values with test loads 50 per cent in excess of the figures given.

Stresses

It has become customary on the Pacific Coast to design steel towers and poles for two different types of steel. One of these is the standard structural grade with a yield point of about 30,000 lb. per sq. in., and the other is a high-elastic-limit steel having a yield point of 45,000 lb. per sq. in. without any reduction in ductility.

The formulas for the working loads are shown in Table IV.

The shear and bearing values given in Table IV for bolts and rivets are the values for working loads. The ultimate strength of the bolts is far in excess of these values as is shown in Table V, which is a summary of a number of tests made throughout the United States and reported to the national subcommittee on strength of materials.

Materials

A brief specification for the materials is as follows: Structural grade steel shall conform to the standard specification of the American Society for Testing Materials for Structural Steel for Bridges, Serial No. A 7-21.

High elastic limit steel shall conform to the standard specifications of the American Society for Testing Materials, Serial No. A7-21, in all particulars except that the yield point shall be 45,000 lb. per sq. in. instead of one-half of the ultimate strength.

Bolts and rivets shall be made from material conforming to the standard specifications of the American Society for Testing Materials for Rivet Steel for Bridges, Serial No. A 7-21.

Design of Poles

1—Dimensions: With the loading previously mentioned the general dimensions of the pole were obtained as follows:

a—The dimension of the cage was made as small as possible, being limited to the values shown (16 in. for the Type A and 18 in. for the Type B) by the strength of the connection at the end of each web member. The use of one bolt for this connection greatly reduces production costs.

b—The base dimension was arrived at by making the total cost of pole and footing a minimum. The value therefore is different for poles set in concrete than for poles set directly in the earth.

c—The height above ground was determined by the sag on a 450-ft. span, maintaining the required 30-ft. clearance between wire and ground.

2—Lacing Details: The lacing or web members all are shown attached to the inside of the leg members with the outstanding edges of the lacing angles turned in. This was done for the following reasons:

a—It makes it possible to attach the crossarms at any point on the cage. Thus the pole is not limited in its use to any one class of line, but crossarms may be attached as desired without making any change in details of the pole.

b—It makes for economy when used with concrete footings by reducing the size of hole required and thereby the amount of concrete required.

c—It allows a smaller diameter hole for the earth footing and, further, permits the attaching of plates on the outside of the legs below ground to stiffen the footing by preventing local concentration of loading below the ground.

d—It reduces the cross-sectional dimensions of the assembled pole without impairing its strength and therefore facilitates shipment.

3—Crossarms: Details are shown for four types of crossarms:

a—Standard wood arms for either pin or suspension insulators.

b—Steel-pipe arms for pin insulators.

c—Channel arms for pin insulators.

d—Angle arms for suspension insulators.

The first three arms are designed for a longitudinal pull of 700 lb. at the top of a 60-kv. pin insulator, as required by General Order No. 64 of the California Railroad Commission, in addition to the vertical loading due to 900 ft. of wire. The angle arm for suspension insulators is designed for a longitudinal pull of 1,500 lb. in addition to the vertical loading due to 900 ft. of wire.

4—Footings: Footing designs are shown for steel set in earth and for steel set in concrete. Where concrete is used the construction of the pole is lightened below ground level by eliminating the lower lacing members. The quantity of concrete required is reduced by using a form for the interior portion.

The steel footings set in earth were given more consideration following the tests of 1924. At that time local failure occurred in the footing just below the ground level due to the load becoming unequally transmitted to the ground. One of the leg members bent between panel points. For the tests of 1925 three types of earth footings were designed. One of these was a tapered footing submitted by the Pa-

cific Coast Steel Company, and two were vertical footings with bent plates to stiffen the footing and prevent local concentration of the reaction of the earth. All three types successfully withstood the test. One of these with parallel sides is shown as a suggested standard, with the Pacific Coast Steel tapered type included as an alternate.

Tests on Steel Poles

In addition to the tests included in the 1924 report of this subcommittee a series of tests was carried on in conjunction with this report at the Davis construction warehouse yard of the Pacific Gas and Electric Company on March 17 and 18, 1925. In all six different types were tested and are reported in detail in Table VI.

The arrangements made for the six tests were on

TABLE VII.—Estimated Cost of Steel Poles

ITEM	TYPE A POLES		TYPE B POLES	
	Battered Pole		Vertical Pole	
	Earth Ftg.	Conc. Ftg.	Earth Ftg.	Conc. Ftg.
Hauling and Handling.....	3.00	3.00	3.00	3.00
Dipping Stub.....	1.00	.....	1.00	.....
Digging Holes				
By Hand.....	5.50	5.50	5.50	5.50
(By Auger).....	(2.50)	(2.50)	(2.50)	(2.50)
Erection and Setting.....	12.00	12.00	12.00	12.00
Steel at 6c.....	138.50	110.00	118.50	169.00
With 3/16" Material for earth stubs.				
Type "A" Pipe Arm				
Type "B" Susp. Arm				
Concrete at \$20 per yard.....	.....	35.00	23.00	.....
35.00				
Total Cost of Pole (Assuming Hand Dug Holes).....	\$160.00	\$165.50	\$162.00	\$190.50
				\$195.50

TABLE VI—Results of Steel Pole Tests Made March 17, 1925 at Davis, Calif. under auspices of P. C. E. A.

Test No.	Description of Pole	Description of Footing	Description of Hole Dug	Point of Load Application	Load in Pounds	Deflection						Remarks
						Center line of pole at elev. of load (Ft.)	Center line of pole at ground (Inches)	Center line angle of deflection at ground	End of Cross-arm (Ft.)	Angle of Twist of end of Crossarm		
										Deg.	Min.		Deg.	Min.
A	Pacific Coast Steel Co. Galvanized steel pole 24 in base tapering to 15 in. cage.	Pacific Coast Steel Co. Galvanized steel "earth" type footing tapering to bottom of hole 8ft. 8in. below ground.	An 18 in. diam. auger hole 8ft 0 in. deep was dug by machine and trimmed by hand 3ft. 0in. square at top to 18 in. square at bottom.	Breast pull	750	1.06	1/8	0	18			
					1,500	3.85	5/8	1	06			
					0	2.22	3/8	0	36			
					2,200	7.56	1-7/8	2	47			
					0	4.76	1-3/8	1	53			
B	Same pole as A.	Pacific Coast Steel Co. 24 in. square ft. 6in. deep steel stub structure set in concrete 7 ft. 6in from ground to bottom of hole.	A 30in diam. auger hole 7 ft. 6in. deep by machine and in concrete 7 ft. 6in from hand to 2ft. 8in.	Breast pull	750	0.59	0	0	06			
					1,500	1.36	0	0	30			
					0	0.50	0	0	12			
					1,500	1.44	0	0	12			
					2,250	2.10	3/8	0	36			
					0	0.79	1/8	0	12			
					800	0.63	1/8	0	06	1.33	7	19
					1,500	1.12	3/8	0	12	3.15	21	40
					0	0.46	1/8	0	06	1.91	15	17
					2,200	Not read	Not read		Not read			
D	Galvanized steel pole with 18 in. bottom tapering to 15 in. cage, designed by sub-committee and manufactured by Pacific Coast Steel Co.	Special steel earth type footing with 18in parallel sides. Set 8 ft. 0in below ground.	A 30in diam. auger hole 8 ft. 0 in. deep was dug by machine.	Breast pull	750	1.06	1/8	0	12			
					1,500	3.85	1	1	18			
					0	2.22	3/4	0	48			
					2,200	7.56	2-1/8	2	41			
					0	4.76	2-3/4	1	42			
C	Same pole as for Test D and E.	Special Steel earth type footing with 18in parallel dug by machine. Set 8 ft. 0 in below ground. Differs from type D footing in details only.	A 30in. diam. auger hole 8 ft. 0 in deep dug by machine.	Breast pull	750	1.06	1/8	0	12			
					1,500	3.08	3/4	1	18			
					0	1.39	1/2	0	48			
					2,200	5.53	1-7/8	2	41			
					0	2.82	1-3/8	1	42			
E	Same pole as for Tests D and C.	Steel Stub structure 18 in square set in concrete. A 8ft. 6in. from ground to collar 12 in. bottom of hole.	A 30in diam. auger hole 7 ft. 6 in. deep was dug by machine. At end of crossarm 5 ft. 6 in. from center line of pole.	Breast pull	800	1.05	1/8	0	12			
					1,500	2.27	1/8	0	42			
					0	0.75	1/4	0	24			
					2,250	4.35	1-1/8	1	36			
					0	1.87	1/8	1	00			
					750	0.75	1/8	0	12	1.91	12	11
					1,500	1.73	1/8	0	30	4.98	36	13
					0	0.13	0	0	06	3.07	32	19
					2,250	Not read	1/8	0	24	Not read	Not read	
F	Pacific Coast Steel Co. Galvanized steel pole with parallel sides giving 15in. square cross-section.	Concrete with steel structure of same section as pole. 8ft. 6 inches from ground to bottom of hole.	A 24in auger hole 7ft. 6in. deep dug by machine. A collar of concrete 12in. above ground to 24in. square was used.	Breast pull	750	1.13	1/8	0	18			
					1,500	3.23	3/8	1	00			
					0	1.65	1/8	0	42			
					2,200	6.17	1-1/8	1	53			
					0	3.45	1/8	1	18			
					750	0.99	1/8	0	06	2.02	10	48
					1,500	2.20	1/8	0	30	5.22	33	18
					0	0.29	1/8	0	00	3.09	30	36
					2,250	3.92	1-1/8	0	54	8.42	54	54
					0	1.20	3/8	0	18	5.15	45	54

four types of steel poles so that comparison of earth and concrete footings under load could be had as well as a comparison of the behavior of the poles themselves under load. Unfortunately only one pole of each type was available. Breast pulls only were made on the earth-type footings to avoid damaging the poles. Comparable breast pulls then were made on the poles after transferring them to the concrete footings. Lastly, torsional loads were applied to the poles at the ends of the crossarms, the poles remaining on the concrete footings.

Three poles were donated by the Pacific Coast Steel Company. Two of these followed a tentative design of the subcommittee, and the third pole was designed by the steel-company engineers. Figs. 1, 2 and 3 cover the general details of these poles and their various footings.

The holes for the footings were bored by a machine auger and trimmed by hand where required. The soil was damp alluvial loam and was rather soft. All backfilling was carefully done around the earth-type footings. The concrete footings were poured solidly against the holes and required no backfill.

The load was applied through a 1/2-in. steel cable which ran through two snatch blocks, one supported on a double-pole guyed structure and the other chained to a spur track. The pull on the test poles was almost horizontal. A winch mounted on a motor truck provided the load. Load readings were taken with a 10,000-lb. capacity Chatillon dynamometer which was calibrated both before and after the tests. After pulling up each load the line was shaken and the block friction practically equalized.

After each 1,500-lb. load was reached the line was slackened and the permanent deflection recorded. The same procedure was followed with the 2,250-lb. loads. As the poles were designed for a working load of 1,500 lb. the deflections for this load were of special interest.

Several conclusions can be made from these tests:

1—Fabricated poles can be designed very closely once the loading data are given.

2—Steel poles set in earth will obtain a considerable amount of relief from broken-wire stresses by the yielding of the foundation, acting in this respect like wood poles. The only drawback is

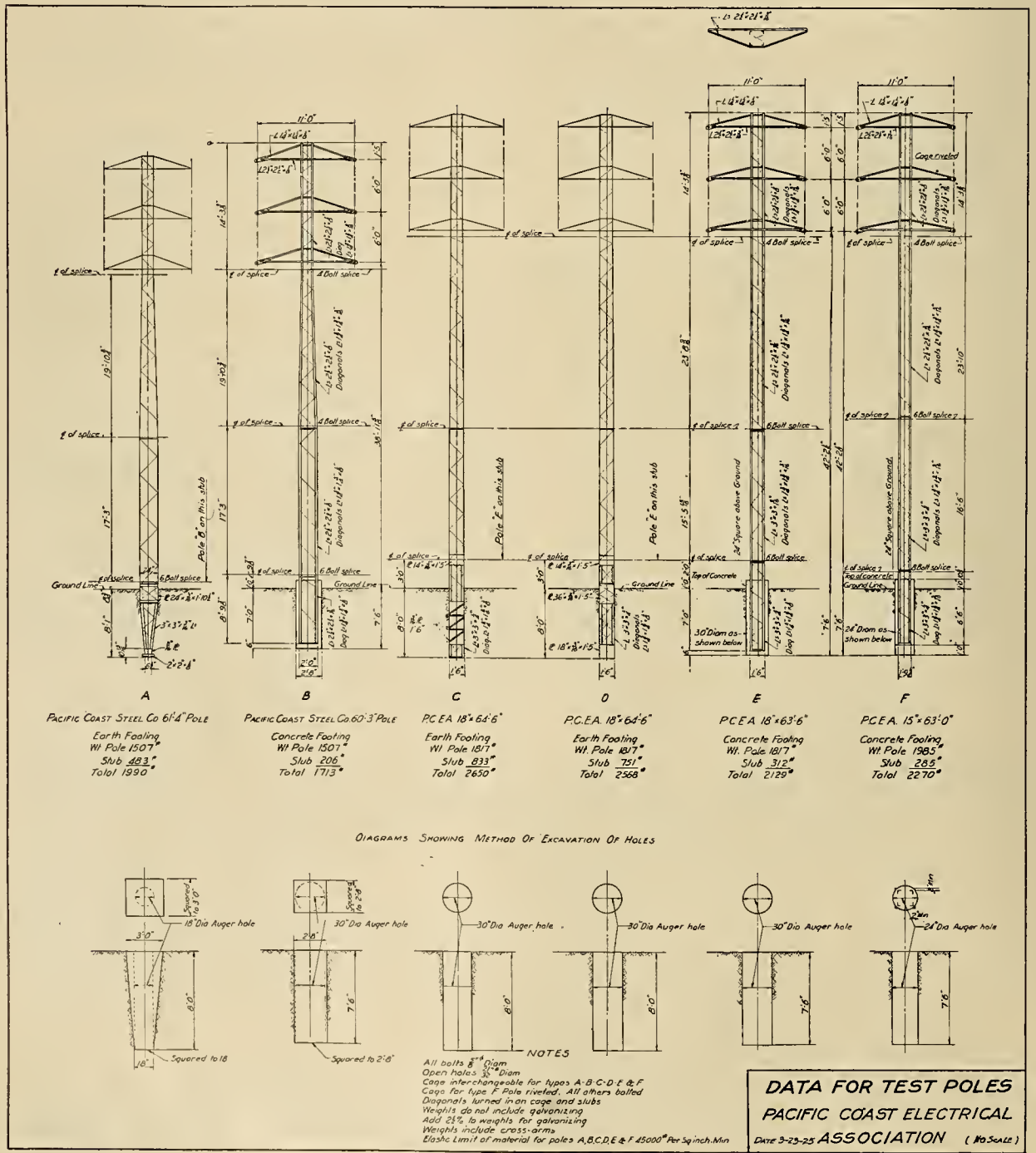


Fig. 3. General specifications and arrangement of steel poles for tests staged by steel pole subcommittee.

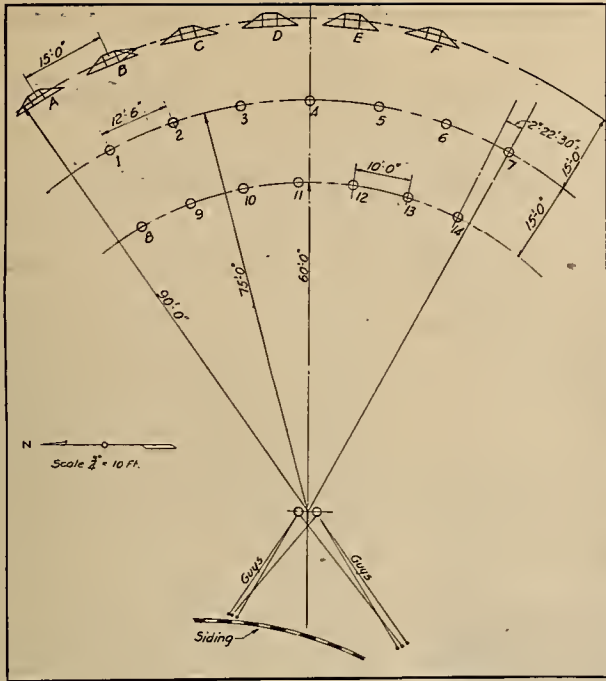


Fig. 4. Plot plan of testing grounds.

that the deflection is appreciable under working loads so that the poles become tilted. It is probable that in the case of the Davis tests this was due largely to the softness of the ground which was quite damp.

3—Steel poles of this type even when set in concrete have quite an elastic deflection which affords stress relief in case of broken wires. At a working load of 1,500 lb. the pole is nearly perfectly elastic when proper allowance is made for the deflection of the foundation.

4—As a result of the tests it is recommended that batten plates be used at the leg splices. This feature is incorporated in the design of the pole.

Suggestions

In conclusion it is desired to state that the subcommittee has striven toward such a design for steel poles as will be readily applicable to various loading conditions, with the smallest possible number of changes in the detail of the pole itself. The various loading conditions of Pacific Coast power companies are appreciated fully. With this in view loadings were selected which were believed to serve the greatest number under California conditions. Thus if the

design meets with the general approval of the power companies only slight modifications in the way of material to be used will be necessary to meet almost any condition that may be desired.

Foundations for the steel poles tested under this report have been allowed to remain in the Davis construction yard of the Pacific Gas and Electric Company, and it is suggested that further investigations

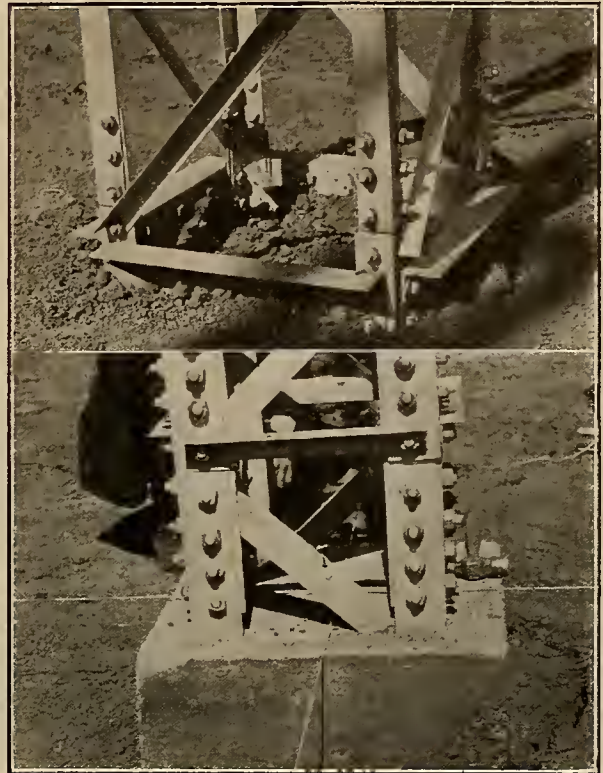


Fig. 5. Above, earth footing after 2,250-lb. breast pull, test A. Below, result of 2,250 lb. pull at end of crossarm. Earth was damp in both cases.

be continued by the 1926 subcommittee, making use of the seasoned foundations to obtain results comparative with those taken by this subcommittee some ten days after the foundations were placed. No doubt there are many questions that will arise respecting this design and it is with this thought that the suggestion is made for a continuance of the subcommittee's work for another year.

Editor's Note.—The second part of this report, covering tests on wood poles, will appear in an early issue of the Journal of Electricity.

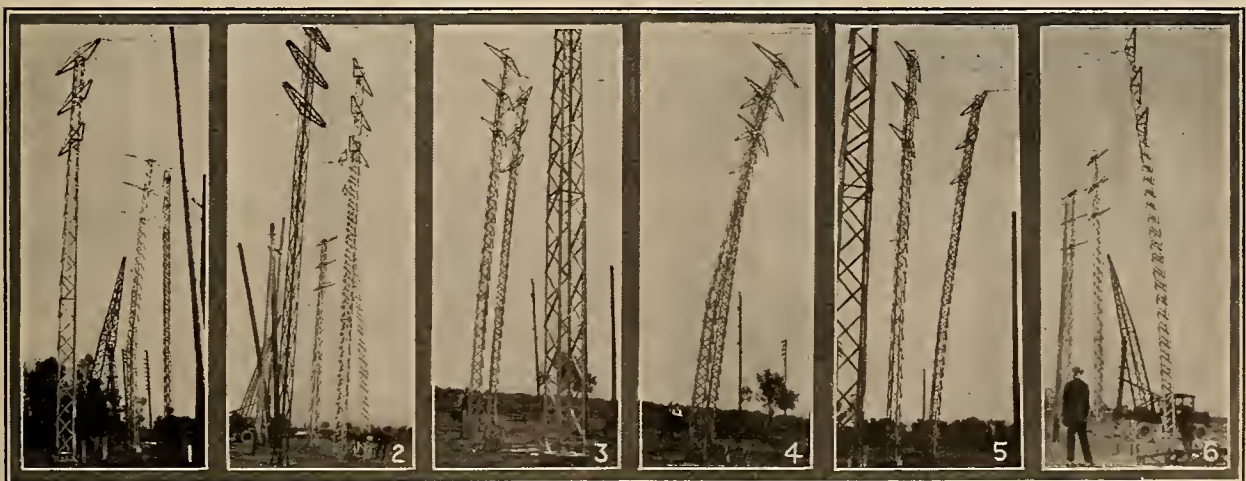


Fig. 6. Steel-pole tests. (1) Test B, failure at 2,200-lb. pull on crossarm. (2) Test D, 2,250-lb. breast pull. (3) Test E, permanent deflection after 1,500-lb. breast pull. (4) Test E, failure at 2,250-lb. pull on crossarm. (5) Test F, 2,250-lb. pull on crossarm. (6) Test F, 2,250-lb. breast pull.

CENTRAL STATION CONSTRUCTION OPERATION AND MAINTENANCE

Penstock Manifold for Pit 3 Is of Unique Design Maximum Hydraulic Efficiency Effected by Mass-Concrete Manifold Which Also Fits Physical Conditions

By CLINTON DE WITT, Assistant Engineer,
Division of Civil Engineering, Pacific Gas and Electric Company, San Francisco.

Penstock-manifold construction at the Pit River No. 3 plant of the Pacific Gas and Electric Company is noteworthy particularly for its large size and low hydraulic losses.

This manifold is essentially a massive concrete block in which the upper 40 ft. of the three 10 ft. 9 in. penstocks is encased. The three circular penstock sections connect to three gently warped passageways about 22 ft. long which change their shape gradually until they merge into a single 19 ft. circle. The manifold is immediately above the power house at the lower end of the 4-mile concrete-lined circular tunnel.

The three penstocks are folded together at their upper ends so that their center points lie approximately at the corners of an equilateral triangle. This arrangement permits a simpler and less violent transition from the three circles to the single large circle than any other method of joining. The middle pipe is raised and the two outer pipes are brought in underneath the middle pipe. A minimum distance of 3 ft. in the clear between pipes was maintained to obtain thicker and stronger transition or partition walls in the taper section than otherwise would be possible. This is shown in Fig. 1.

Hydraulic pressure inside the manifold ranges from 80 to 100 lb. under

static conditions. Great circular rings of reinforcing bars completely surrounding the three passageways resist this expanding pressure. In addition, the transition or partition walls are

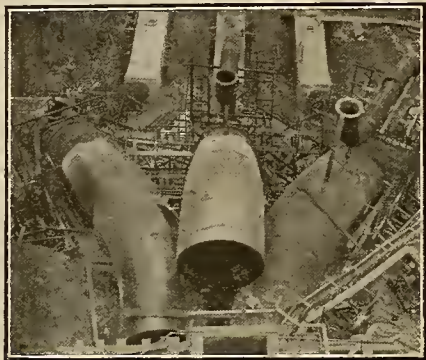


Fig. 1. Looking down upon the three penstock pipes showing their triangular arrangement at the manifold site. The standpipe connections, two of which are complete, are shown also. The first 40 ft. of these pipes subsequently was encased in a solid concrete block.

reinforced for a differential of pressure between any two passageways.

The transition section from the single 19-ft. circular section to the three 10 ft. 9 in. circular section was maintained at practically constant

area. Sections at 2 ft. intervals were plotted in the office and dimensioned in detail, thus enabling the form carpenters to make templates at these sections for their interior formwork. Reference to Figs. 2 and 3 will show the changes in shape at the different contour points and the relative location of each point. In spite of the rather elaborately curving walls the form work was comparatively simple and inexpensive.

For the lower two pipes deviations from the theoretical transition sections were required to permit a sluice pipe intake to be installed. Troughs were formed gradually along the floor of these pipes, as indicated in Fig. 3, and gradually dropped and merged together so as to discharge into a 24-in. sluice pipe. The sluice pipe carries debris to a sluice trap and finally discharges into the main waste pipe from the surge chamber. Any debris carried along the floor of the tunnel will drop into this sluice pipe and thus be prevented from going through the turbines.

The upper butterfly valves controlling the penstocks are located just in front of the main block of concrete of the manifold. A concrete house for the protection of these valves extends the full width of the manifold block and forms an integral part of it.

The standpipes which protect the penstocks from collapse upon sudden closure of the butterfly valves rise from the top of the manifold block and are set into the solid concrete of the block. Connection between the standpipes is through the smaller curved pipes, two of which are shown

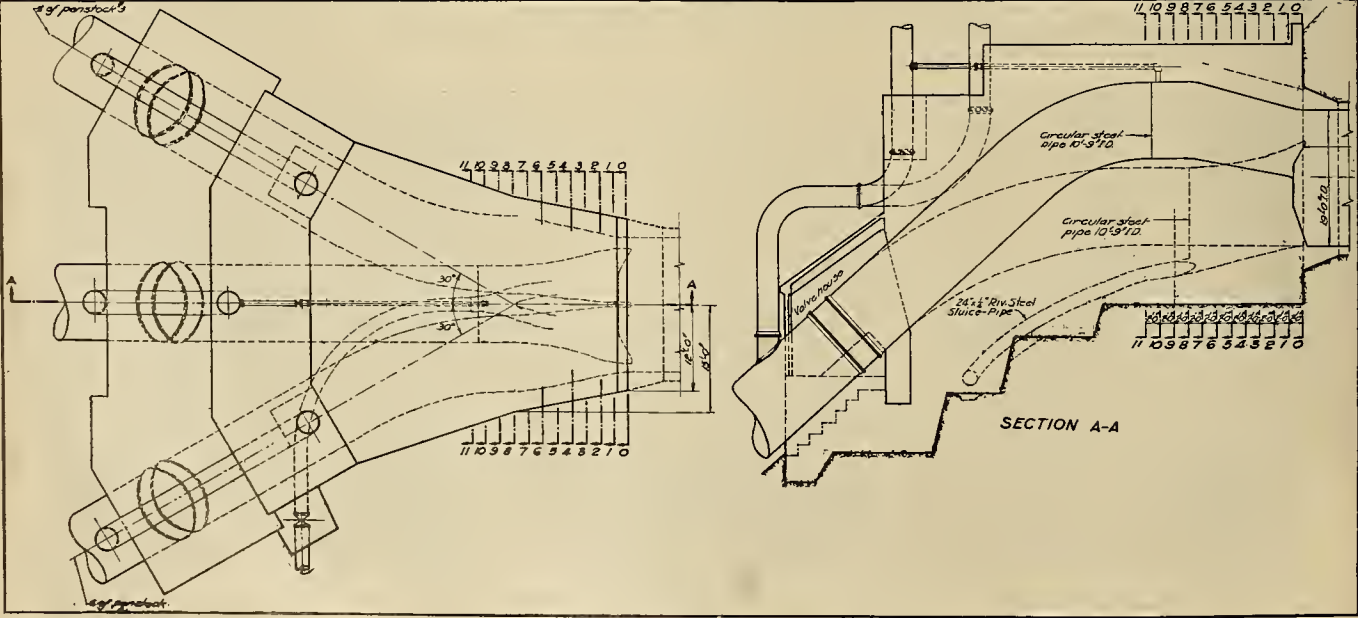


Fig. 2. Plan (left) and central vertical section (right) of penstock manifold and block showing the relative arrangement of the three pipes and indicating (right) the locations of the contour sections shown in Fig. 3.

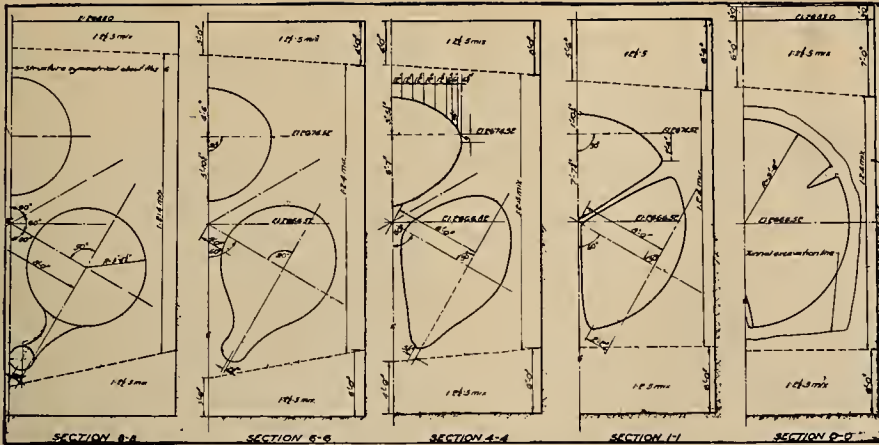


Fig. 3. Five progressive sections showing (from right to left) the smooth transition from a single circular section to three circular sections and showing also the method of dropping the sluice trough. This transition is accomplished in formed concrete.

in place in Fig. 1 and all of which are indicated at the left in Fig. 2.

The entire manifold block acts as the upper anchor for the penstocks for both vertical and horizontal thrusts. The concrete mix was varied to give most strength where needed. The sections below and above the pipes are of 1:2½:5 mix while that actually encasing the pipes is 1:2:4 mix.

The very large size of the tunnel and penstocks and the head under which they operate made the design

through-bolts to resist the hydraulic thrusts. Through-bolts cause hydraulic disturbances and vibrations and result in considerable head-loss in fast-moving water.

As the Pacific Gas and Electric Company spent about \$13,000,000 for this plant with a 315-ft. static head it may be seen that each foot of head may be capitalized roughly at \$44,000. For this reason types of construction giving the smoothest flow and least head loss are the most desirable if first cost is not unduly excessive.

The type of manifold chosen has a practically negligible head loss except for the sluice-pipe troughs. These troughs are required for any type of manifold chosen and any loss resulting from their presence would be common to all types. The taper of the transition is most gradual. No obstructions or sharp changes of line are present.

The amount of concrete in the manifold block is not greatly in excess of the quantity required to resist the forces acting on it in its capacity as the anchor for the upper ends of the penstocks. This means that the concrete yardage could not be lessened greatly, regardless of the type of manifold used.

The ensemble structure has a pleasing appearance particularly when viewed from the power-house flat below. Results are entirely satisfactory.

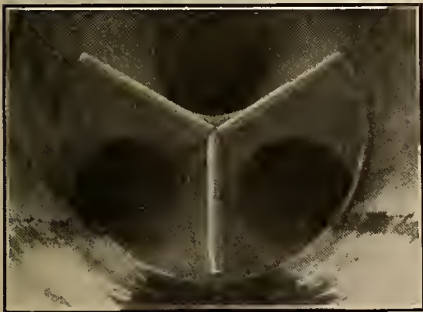


Fig. 4. Interior of tunnel looking toward manifold showing smooth transition.

of the ordinary "Y" or branching type of manifold very difficult structurally. This latter type unless embedded in reinforced concrete block requires

ling of equipment and particularly communication equipment in times of trouble will expedite matters in a valuable degree.

Repairing and adjustment of telephone equipment should not be fostered or even permitted except in certain specific cases and then only in accordance with written instructions. Telephone apparatus is comparatively delicate and should be cared for by one who not only well knows how but who is progressive and in good practice. Telephone maintenance is accomplished best by a man, or men as the case may be, who covers the entire system or a designated part of it, and who visits all installations of communication equipment checking and testing all instruments and auxiliary apparatus. All spark gaps should be inspected regularly to insure their proper spacing and cleanliness; all fuses should be inspected to ascertain that they are of the proper rating and firmly held in the clips; windings of induction coils, receivers, bells, relays and other devices should be tested to assure that no part of them is shorted or grounded; resistance of the transmitter button should be measured and the condition of all batteries ascertained. All switches should be inspected periodically to make sure that they are in operating order and make good contact. No dust or cobwebs should be allowed to accumulate.

The testing of windings and circuits can be made best with a resistance meter. The San Joaquin Light & Power Corporation uses a Stewart "Detecto-meter" supplied by the Kel-



Fig. 20. The "Detecto-meter" which facilitates the testing of telephone circuits and windings.

Power Company Communication Systems—III (a)

Maintenance of a High Degree of Insulation Proves to Be Secret of Overcoming Operating Difficulties

By H. N. KALB*, Telephone Engineer, San Joaquin Light & Power Corporation, Fresno.

Eternal vigilance is the price of good service in any line, and power company telephone lines are no exception to this rule. This fact applies not only to the electrical and mechanical parts of the system but applies as well to the human element in the use and operation of the system. It is true that if no trouble occurs at a station or substation for a long period of time the operator will fail to do his part as efficiently as he has done it when he has been experiencing an appreciable amount of trouble right

along. In other words, practice makes perfect in this as well as in other fields of endeavor. Hence to make an attendant more proficient, at intervals he should go through the operations as nearly as possible in the same way as he would if or when caring for trouble. This will keep him "on his toes." Under this system, when trouble does come, the operator will act not from memory alone nor from habit alone but from a co-mixture of these, together with the assurance that he has gained through experience with his apparatus. Self-confidence in the hand-

logg Switchboard & Supply Company. This instrument is shown in Fig. 20. The calibration is directly in ohms on a scale similar to the scale of an ordinary voltmeter. This instrument also may be used as a d.c. voltmeter. Experience proves that with this portable instrument resistance values can be checked very rapidly. Results are a great aid in maintenance work. Normal procedure is to make a list of readings as they should be when the equipment is in first-class condition and to check subsequent readings against this standard list. It takes a man but a short time to memorize this list of readings, and the work itself consumes but little time.

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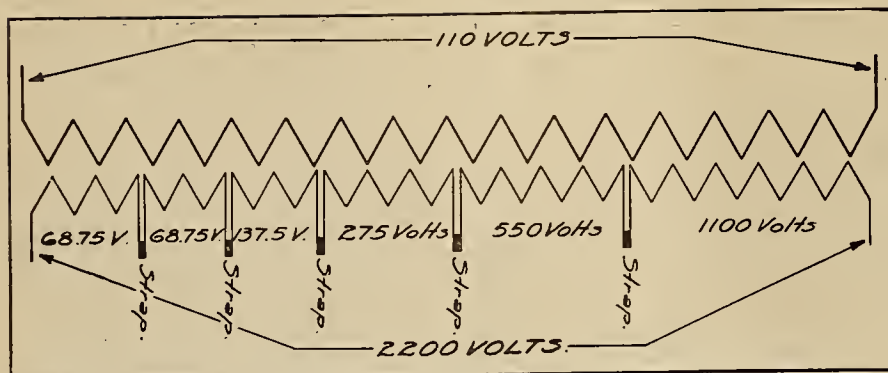


Fig. 21. Schematic wiring diagram for a special dry-type transformer for high-voltage tests on telephone equipment.

All wiring in conduits and not protected by insulating transformers is subject to severe over-voltage duty and should be rubber-insulated. As rubber deteriorates rapidly it is well to test such wires about once in two years. This test is performed best by the use of a 110/2,200-volt dry-type transformer. This transformer should have several taps on the high winding so that 2,200, 1,100, 550, 225, and 112.5 volts may be obtained when using 110 volts on the low winding. In making the aforementioned insulation tests the 110-volt winding should be connected to the 110-volt supply of the station and the 2,200-volt windings connected to the wires to be tested. It is necessary to test between wires as well as to test between wires and ground or the conduit itself. In passing it is well to say here that all conduits should be grounded positively. The testing transformer should be fused on the low-voltage side with a 1-amp. fuse. This will obviate trouble in event of break-down of wires under test.

Line troubles on power-company telephone lines are about the most difficult to locate of any kind of trouble. Telephone lines are constructed to carry the extremely small output of the telephone instrument, but are subjected continually to the varying influence of adjacent power conductors which carry heavy currents at high voltages. As long as the communication line and connected apparatus are well insulated from ground and the exposure to power wires, of each wire of the telephone circuit is exactly the same; the size of each wire of the telephone circuit is the same; the insulation to ground of each wire of the telephone circuit is the same; and each wire of that circuit is of exactly the same material and has the same joints or splices—just so long will good conversation with little interference from noise be possible over the line. If these conditions are satisfied, good conversation will be possible even though the voltage of the telephone line to ground may be high. It should be remembered that this is the whole secret of good service over power-company telephone lines when power trouble is being experienced. There may be but little potential to ground from the communication circuit under normal conditions, but when trouble occurs on the power circuits adjacent there may be high voltages to ground that may break down inadequate equipment just when good telephone transmission is of more than usual importance.

A good 2-kv. insulator such as com-

monly used on 2.3-kv. distribution circuits should be used as a line insulator, and once such an insulator is adopted it is best to use nothing else. It must be remembered that the insulation to ground of each wire not only must be good, but it must be the same. To put this in other words, the leakage to ground from each telephone conductor of the circuit must be the same. If the exposure of each wire of the circuit to adjacent power wires is not the same, the wires will not have the same voltage to ground and a circulating induced current will result. This in turn will cause a noisy line. If the two wires of the communication circuit are not the same size and of the same material their exposure will not be the same and their conductivity will be unequal. Both of these will tend to unbalance the line. Poor or non-uniform joints also tend to cause line unbalance and must be cared for. It is well to remember that each telephone wire acts as one plate of a condenser and the power wires taken as a whole act as the third plate of this same condenser. Thus a split or balancing condenser is formed of which the power wires, acting as one condenser plate, are the charging source. If both of the telephone wires are exposed equally to the power wires, each will receive an equal charge of the same polarity at the same instant. This will result in no interference, other things being ideal. The only result will be a balanced voltage between both of the wires and ground. However, if the leakage of one telephone wire to ground is greater than that of the other wire of the same circuit, there will be an unbalanced voltage to ground and a circulating current in the line and attached instruments resulting in noise and consequent interference. The effects discussed in this paragraph are only from electrostatic induction or the induction due to the impressed voltage on the adjacent power wires and bear no relation whatever to the amount of power current flowing in the power line.

Electromagnetic induction is another source of induced currents in telephone lines. In this case the induction is caused by and is proportional to the amount of current flowing in the power line. The relation between the two lines in this case is that of the two windings of a transformer having an air core. The power wires act as the primary and the telephone wires as the secondary of this transformer. Both of them are in a common and fluctuating electromag-

netic field, with the result that a current is induced in the telephone circuit. This action between lines induces a voltage in each of the telephone wires of the circuit, the polarity of which is the same at any instant. Further, if the exposure of the two telephone wires is the same, the voltages induced in the wires will be equal. As before, the presence on the telephone line of this potential to ground will cause no interference, other conditions being ideal. And again if the leakage of the two wires of the circuit is not the same an unbalanced condition will prevail, causing a circulating current and a noisy line.

Editor's Note.—This is the first half of the third and last of Mr. Kalb's series on communication systems for power companies. The closing installment will appear in the next issue.

Some Interesting Northwestern Line Construction

By J. E. YATES, Assistant Chief Engineer, Pacific Power & Light Company, Portland.

Recent transmission-line construction of the Pacific Power & Light Company, Portland, Ore., has included two lines of special interest: The Hanford-Taunton (Wash.) line, to effect a second connection with the system of The Washington Water Power Company at Taunton, and the Pomeroy (Wash.) Lewiston (Idaho) line, to connect the newly acquired Lewiston property with the company's existing Yakima-Walla Walla (Wash.) system. This latter line also provides a third connection with The Washington Water Power Company through its tie line from Moscow to Leon Junction, Idaho.

The Hanford-Taunton line is 15½

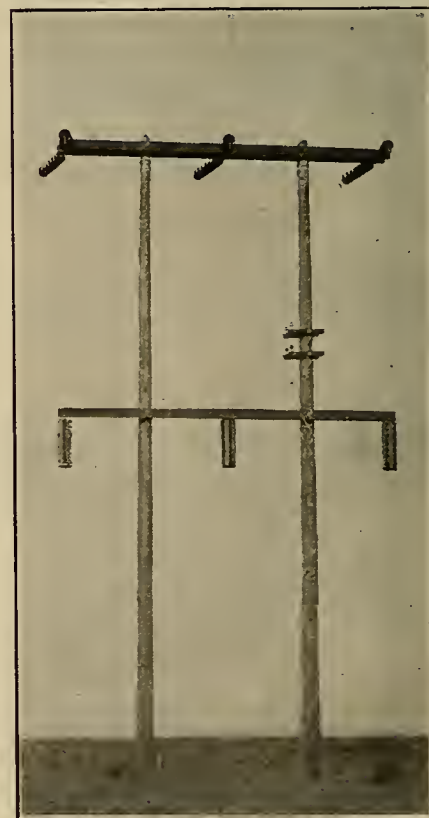


Fig. 1. Angle structure in the Hanford-Taunton 110-kv. line of the Pacific Power & Light Company. An extra crossarm and three strings of insulators are stored at this and several other points along the line.

miles in length and operates at 110 kv. The country traversed is fairly level and no particular construction difficulty was encountered. Standard H-frame towers were used. Each tower is composed of two 55-ft. wood

This line is carried throughout most of its length on Locke pin-type insulators on a single line of 45-ft. wood poles set on 250-ft. centers and with triangular configuration. At angle and strain points strain insulators suspended from H-frame towers carry the 1/0 stranded copper conductors. H-frame construction also was used over a portion of the rough country where spans as long as 600 ft. were desirable.

Because of the rocky formation of the ground most of the pole holes had to be "shot." To expedite the drilling an Ingersoll-Rand portable, gas-engine-driven compressor with a capacity sufficient for two guns was utilized. This compressor equipment was mounted on wheels so that it could be drawn behind a truck. In the case of some hole locations, however, the compressor could not be brought close enough to reach the pole site with the air lines. Such holes had to be drilled by hand. Wherever possible the poles were raised by an auto pole-derrick.

Here again the rough terrain hampered operations in some sections to the extent that a number of poles had to be raised by hand after having been snaked to the hole by motor-truck power applied to lines strung through snatch blocks.

The raising equipment mentioned above consists of a 2½-ton truck over the rear axle of which is mounted a 30-ft. A-frame derrick so hinged that its top can be swung clear of the truck bed at any desired angle. A hoist is mounted on the forward end of the truck bed and is run by the truck engine.

On this job the company's portable camp outfit was used. One unit of this outfit consists of an office tent, a mess tent and three bunk tents mounted on wagon beds so that they can be drawn by horses or behind trucks. Such a unit accommodates 28 men. It was found practicable to move

nance work accomplished during the past year, is part of a large program intended to improve service on the company's system. Begun four years ago, this program will continue through 1926 when the present plans will be completed. Then there will be a comparatively new 66-kv. transmission line of 1/0 copper from the Naches generation station west of Yakima through Pasco, Walla Walla and Pomeroy to Lewiston. Much of the old line between Yakima and Pomeroy has been rebuilt and there remain only two sections to be completed during 1926. Some of this line was built as early as 1905 and used small poles and aluminum conductors. These two sections are between Prosser and Richland Junction and between Dayton and Tucannon.

Tests of Turbine Governor Made at Seal Beach Plant

The installation of a new type of governor on the new 48,000-hp. turbine at the Seal Beach plant of the Los Angeles Gas and Electric Corporation by the Westinghouse Electric & Manufacturing Company is proving highly satisfactory in the prevention of overspeeding on the part of the turbine when the generator loses its load.

Several tests were made to determine whether or not the governor would perform as expected. At 8:30 on the night of Dec. 8 the main oil switch at the Seal Beach Station was opened, which meant the dropping of 20,000 kw. load, which the turbine at the station was carrying, on the Alameda Street Station. At 7:22 p.m. on Dec. 9, a load of 31,000 kw. and at 8:23 on the same evening a load of 39,000 kw. was dropped on the Alameda Street Station. The new governor held the speed of the big turbine at Seal Beach well within safe limits, and the operator was able to synchronize it with the system again in about two minutes. The Alameda Street Station picked up all of these loads without any of the more than one hundred thousand consumers knowing that anything out of the ordinary had happened.

The last test was made on the evening of Dec. 11 with A. B. Day, vice-president and general manager, and several Westinghouse officials present. At this time a load of 35,000 kw. was dropped and the Seal Beach Station was back on the line in one and a half minutes, Alameda Street Station picking up the load without any disturbance to the system.

Motor-driven pumps are overcoming one of the most serious handicaps to successful cotton-raising in Mexico. The Laguna territory comprising some million acres of fertile land near Torreon in central Mexico has been found to be even better adapted to cotton culture than are our Southern states with the exception of the erratic natural water supply. This difficulty has been and is being overcome by tapping the underground storage reservoirs through the use of electric pumps. Central generating stations, operating at 2.4 kv., 60 cycles, are being installed at convenient locations and lines strung from these to the pump sites. Most of the pumping equipment operates at 440 volts. The depths of the wells varies from 50 to 350 ft.



Fig. 2. An indication of the roughness of some of the country traversed without special equipment.

poles spaced on 11-ft. centers and a 23-ft. crossarm. These towers are placed about 500 ft. apart. Number 1/0 7-strand copper conductors are suspended on 6-unit string of Westinghouse 10-in. disc insulators hung on 11-ft. centers. The high-line telephone of No. 8 solid, extra-high-tensile strength, copper-weld wire, is supported on a 2½-ft. crossarm mounted on one of the poles 14 ft. below the high-tension crossarm.

Leaving Hanford to proceed north to Taunton, the line crosses the Columbia River necessitating a span of 2,726 ft. The design of the crossing span was simplified, however, by the existence of an island in the river on which could be erected a supporting tower between the strain towers on either shore. This made the unsupported spans 1,074 ft. from the south shore and 1,652 ft. from the north shore. This advantageous situation, coupled with other determining factors, led to the choice of wood instead of steel for the towers carrying the crossing. Three 4-pole towers were designed for the purpose. The elevation of the banks and the island made necessary the use of 65-ft. poles on the south bank, 120-ft. poles in the center supporting tower and 95-ft. poles on the north bank to produce a graded line with a minimum clearance over the river of 60 ft. The ½-in. conductors used in the growing span are extra-high-tensile-strength stranded copper-weld steel wire.

The 66-kv. Pomeroy-Lewiston line, 29½ miles long, presented a more difficult construction problem because of the extremely rough country traversed by a portion of the right-of-way. The absence of roads along the route made it necessary to drive the truck across country. As indicated in one of the accompanying illustrations, a number of difficult grades were encountered.



Fig. 3. Setting poles in the 66-kv. Pomeroy-Lewiston line with a derrick mounted on a GMC truck.

camp about every six miles, working three miles in each direction from each camp location. C. S. Knowles, superintendent of construction for the company, built both of these lines.

This line construction, coupled with certain other rebuilding and mainte-

IDEAS FOR THE CONTRACTOR

Electrical Advertising—Its Forms and Design—IV

Floodlighting, Outline Lighting and Some of the Methods
of Designing Less Simple Exposed-Lamp Signs

By C. A. ATHERTON, National Lamp Works of the General Electric Company

5. Building Displays—Floodlighting

A building that is suited to it should be floodlighted by means of one or more groups of projectors. The principal problem is to find suitable locations for the projectors and to determine their number and size.

It is usually found to be easier and less likely to cause glare from stray light when the projectors are concealed at points below the wall or building face that is to be illuminated, but above the heads of the passersby. However, the location of the projectors should also be carefully studied with a view to the shadow effect. Most architecture is designed around the shadows from the sun. The improper location of the lighting units may cause grotesque inverted effects. For building faces which reach down to within short distances from the ground, the projection distance should not be too great, as very narrow, high intensity beams of light are visible because of the dust

and moisture in the air. These bright streaks of light attract attention to the projectors rather than to the building.

It frequently happens that the only possible location for the projectors is on a ledge, balcony, or marquee of the building which is to be lighted. The latter usually gives considerable flexibility in working out the lighting, but from the narrower ledges and balconies smooth lighting will not result. There may, however, be vertical lines, such as columns, which may be brought out, or streamers of light crossing at angles with the lines of the architecture may in some instances be found desirable. Pools of light may be introduced at various points in effective manner. Artistic use of colored light in this way is especially effective in adding depth and interest to a structure. With color it is especially important to provide the additional wattage necessary to bring up the brightness to levels comparable with that from clear lamps.

Rules for Floodlighting Installations

The following rules for determining the proper number and size of projectors will hold for all ordinary floodlighting installations.

a. Use from 2 to 20** (or more) watts per square foot of surface to be illuminated, depending upon the following:

The color of the surface; if it is white, it requires less wattage than it does if it is colored.

The shape of the surface; if it is irregular, so that a great deal of light spills out into the air, it requires a larger wattage.

The efficiency of the projectors; if they are to be located at a great distance and consequently are shaped so as to confine the light within a narrow angle and therefore utilize a smaller proportion of the light from the lamp, the display will require more wattage per square foot.

The brightness of the district; if there are other bright objects near by, it requires more wattage.

The color of the light; blue and green light require much more wattage than do orange and yellow and these require more than does uncolored light.

SUMMARY

Principles of Sign Design

Factors to be Determined	TYPE OF SIGN		
	Exposed-Lamp Signs	Enclosed-Lamp Signs	Silhouette Signs
Best Ranges of Effectiveness	250 ft. — to several miles	Up to 500 ft.	Up to 1,000 ft.
Letter Height (in feet) This quantity determines the maximum legibility distance.	Greatest Viewing Distance (ft.) $H = \frac{\quad}{250}$	Greatest Viewing Distance (ft.) $H = \frac{\quad}{300}$	Greatest Viewing Distance (ft.) $H = \frac{\quad}{350}$
Lamp Spacing (in feet) This factor determines the smoothness of illumination	Shortest Viewing Distance (ft.) $S = \frac{\quad}{1,000}$	Lamps spaced not more than 6 inches apart in any direction	Lamps spaced on 6-inch centers
Number of Lamps	$N = \frac{H}{S} \times \text{No. of Letters} \times 2\frac{1}{2}$	$*N = \frac{WH \times \text{No. of Rectangles}}{40}$	Depends upon actual size

	District Brightness	Lamp Wattage***	Lamp Wattage	Lamp Wattage
**Lamp size Obviously the brightness of the display is influenced by this factor.	1	75-100	60-75	100
	2	75	60	75
	3	50- 75	50-60	75
	4	50	50	60
	5	20- 50	50	60
	6	20	40-50	50
	7	15- 25	40	50
	8	15	40	40
	9	10- 15	25-40	40
	10	10	25	25

* See page 460, Journal of Electricity, Dec. 15, 1925

** See note page 459, Journal of Electricity, Dec. 15, 1925.

*** For distances which exceed one mile, use this formula:

Lamp Watts = 10³ $\frac{\text{Greatest Viewing Distance}}{\text{District Brightness factor}}$

- b. Make the top of the building brighter than the bottom.
- c. Conceal the projectors and locate them so that no part of the beams can possibly strike the eyes of people on the streets.
- d. The choice of the size and angle of the beam of the reflectors depends upon the size of the surface to be illuminated and the distance from the surface to the reflectors. The dimensions of the ellipse of light resulting from a given distance, angle or incidence and angle of beam may be obtained from tables supplied by the manufacturer of the projector. The area of the ellipse should be a small part of the surface to be illuminated; every part should receive light from more than one projector so that streaks in the individual beams may be eliminated and the outage of a unit will leave no area dark. The standard (and most commonly used) units employ 250, 500, and 1,000-watt Mazda C lamps.

6. Building Displays—
Outline Lighting

For exposed and enclosed-lamp building displays the rules of sign design hold good. A slightly lower order of brightness is sometimes employed. In outline lighting the lamp spacing is often determined by the building architecture (See Fig. 5 A-B). Sometimes, however, a metal strip carrying the sockets and wires is fastened on the outside of the building face. In this case, and wherever the lamp spacing does not have to conform to the building architecture, it should be as follows:

Lamp Spacing for
Building Outline Lighting

$$S \text{ (In feet)} = \frac{D' \text{ (In feet)}}{500}$$

The proper size of lamp for building outline lighting should be the same as that which is used under similar conditions for an exposed-lamp sign except that much more frequently the lamps are placed in eye-level positions and should on all such occasions have

diffusing bulbs. The proper lamp size may be determined from the following equation:

Lamp Watts—
Building Outline Lighting

$$\text{Lamp Watts}^* = 10 \times \frac{\sqrt{D'' \text{ (In feet)}}}{\text{D.B.F.}}$$

For Further Study
It is, of course, impossible to discuss all of the phases of such a very great subject as electrical advertising in such a short article, so it is necessary to refer the reader for such subjects as color, its psychological effects, uses, etc., flashing and other motion, and all such specialties as the line of small show window signs, show case novelties, monogram, and carriage call signs, etc., to the more complete treatise on this subject under the title of "Electrical Advertising" by C. A. Atherton (Signs of the Times Publishing Company, Cincinnati).

DESIGNING LESS SIMPLE
EXPOSED-LAMP SIGNS

There is a basic method of design for all exposed-lamp signs. The approximate rules as given previously apply only to simple patterns such as standard block letters. For all other patterns, to assure any degree of accuracy in the predetermination of the final appearance, a more accurate method must be used. This method consists of calculating the size of the spots of light from the lamps for a given viewing distance under the existing conditions, then making a scale drawing using spots to represent the lamps in the sign, and examining the sketch at a distance proportional to the actual viewing distance desired. Two principal determinations are necessary, the size of the sign and the lamp spacing. The greatest distance at which a sign must be legible defines the size; the shortest distance at which the sign must have a good appearance determines the lamp spacing.

* See note on page 459, Journal of Electricity, Dec. 15, 1925.

Unfortunately the calculation of the exact size of a spot of light from a lamp (which affects both sign size and lamp spacing) is a rather complicated procedure. The spot size depends upon the distance to the observer, the atmospheric conditions, the candlepower of the lamps in the direction of the observer, the nature of the reflecting surfaces behind the lamps, the brightness of the district, and the proximity of other bright objects in view.

Effect of Irradiation

If the lighted filament of a single clear lamp, for example in a sign letter of trough construction, is viewed from a distance of three feet, it appears only a little larger than the unlighted filament. As the observer walks away from the sign, however, the filament parts seems to coalesce into a ball of light which increases in size until it entirely fills the bulb, and then keeps on expanding as the distance increases until it appears larger than the trough itself and finally, if viewed from a distance of a mile, the spot will actually appear about five feet in diameter.

This phenomenon, by which bright objects appear larger than dark objects of the same size, is known as irradiation, and is characteristic of the functioning of the eye. The eye, because of its construction, cannot resolve objects which subtend angles of less than one minute of arc; if details lie closer together their images strike the same unit of the retina, which is then stimulated as though only one image fell upon it. However, although not resolvable, the object may still be visible for a great distance because of its brightness. Thus a light source of one candlepower may be seen for 1.7 miles. The filament of a sign-lamp, when viewed from a distance of, say 30 feet, may form an actual image on the retina somewhat smaller than the area of one unit of the retina. As the viewing distance is then increased, the actual image becomes smaller and smaller, but the recorded visual impression remains constant in size. Meanwhile the visual impression made by other elements of the sign, such as

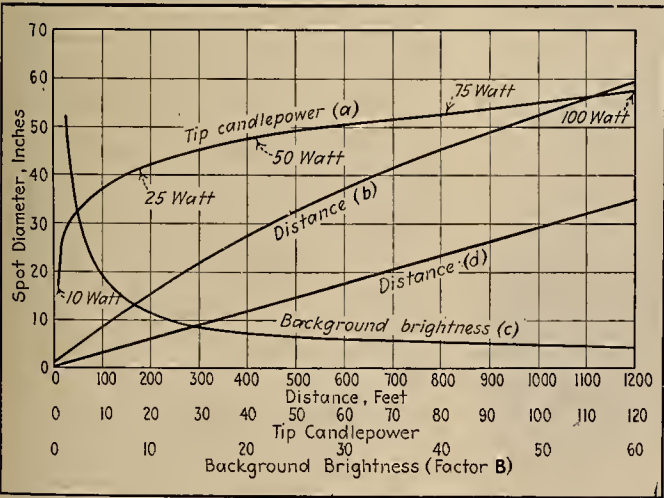


Fig. 26—Apparent spot sizes for an isolated lamp under different conditions.
(a) Distance = 1,000 ft. Absolutely black background. Varying tip candlepower.
(b) Tip candlepower = 81. Absolutely black background. Varying distance.
(c) Tip candlepower = 81. Distance = 1,000 ft. Varying background brightness.
(d) Minimum angle of differentiation.

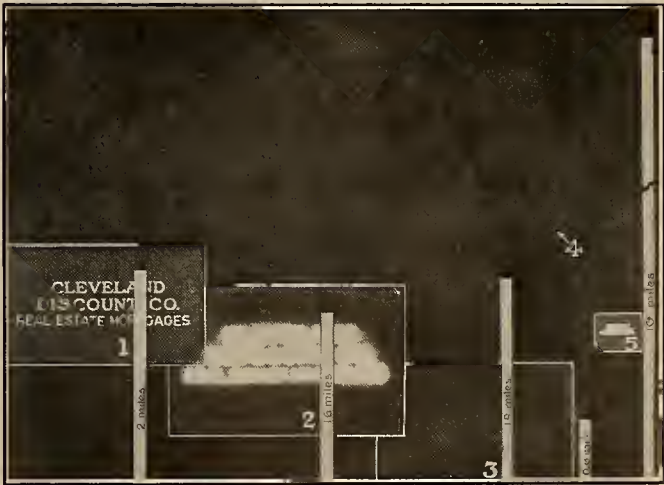


Fig. 27—1. Legible at two miles and no irradiation. The atmosphere exactly balances the irradiation effect. This atmospheric condition produces the theoretical maximum legibility distance.
2. The sign at 1.6 miles in clear air. The effect of irradiation is apparent.
3. The sign at 1.9 miles in a light haze.
4. The sign at 0.6 miles in a heavy haze.
5. The sign ten miles away in a clear atmosphere. The sign can be seen but is not legible.

the separation between lamps or letter strokes which subtend a larger angle, gradually become smaller, and presently the spot of light from a single

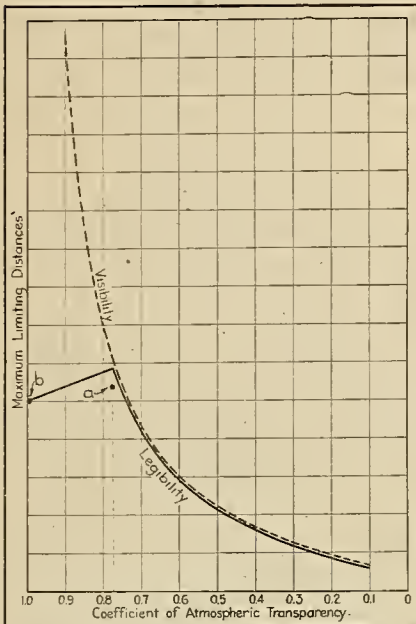


Fig. 28—The effect of atmospheric absorption is at first to increase the maximum legibility distance and as the atmosphere grows thicker to decrease it.

"a" represents condition "1" in Fig. 27.
"b" represents condition "2" in Fig. 27.

lamp is as large as any of these elements. The letter strokes are then blurred together and the sign becomes an illegible mass of light.

Fig. 26 indicates the magnitude of the change in spot size. It should be noted, however, that the effect of irradiation becomes greater as the candlepower is increased, because of sympathetic stimulation of adjacent elements of the retina, and smaller as the background (such as that of the sky or building) becomes brighter. For example, by adding a border of lamps to a sign, the background brightness is increased and the apparent spot size is greatly reduced, thus making the sign more legible.

Atmospheric transparency also affects irradiation. In many large cities the atmosphere at times becomes very dense and absorbing. The fog, haze, or smoke has the effect, first of reducing the amount of light which reaches the eye, thus reducing legibility, and second, of refracting the light from the sign and other sources in the district so as to make a bright curtain of light which increases the surrounding brightness, reduces irradiation, and increases the distance at which the sign is legible. The appearances of a sign under five conditions of the atmosphere are shown in Fig. 27.

Within the practical limits of sign design and because larger lamps are ordinarily used in brighter districts, and smaller lamps in darker districts, average conditions and values of these effects may be assumed, thereby making possible a simple but accurate method of predetermining sign appearance.

The exact calculation of the spot size and the confetti method of predetermining sign appearance will be discussed in the next article.

COLOR MEDIA FOR ELECTRICAL ADVERTISING

Natural Colored Glass Lamps

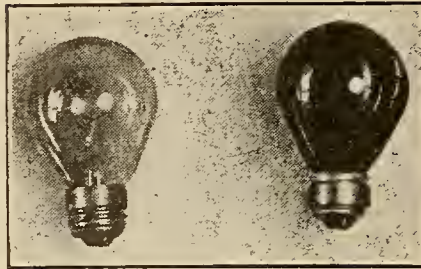


Fig. 22.

Advantages—Good color efficiency, permanent color, brightness and sparkle in higher signs, and smooth surface minimizes dirt collection.
Disadvantages—Higher cost, not ordinarily carried in stock, unattractive when not lighted.

Color Hoods

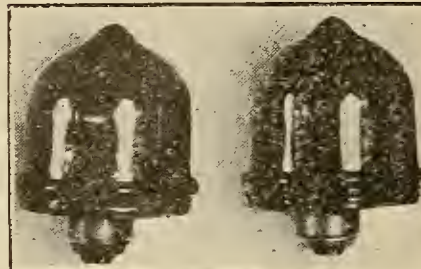


Fig. 23.

Advantages—Good color efficiency, permanent color, brightness and sparkle in higher signs, clear lamps only need be carried in stock.
Disadvantages—Unattractive by day, excessive dirt collection.

Dipped Lamps

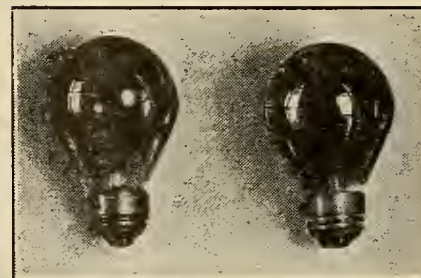


Fig. 24.

Advantages—Fair color efficiency, color readily changed, large range of colors.
Disadvantages—Rapid fading, some brightness and sparkle lost in higher signs.

Spray-Coated Lamps

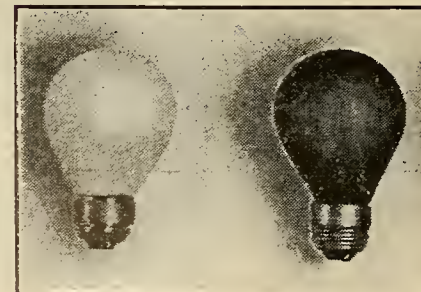


Fig. 25.

Advantages—Attractive color when unlighted smooth appearance at the nearer viewing distances.
Disadvantages—Lower color efficiency, some colors gradually affected by certain atmospheres, brightness and sparkle sacrificed in higher signs.

Questions and Answers on the Code and Safety Orders

Arrangements have been made with Claude W. Mitchell, electrical engineer of the Board of Fire Underwriters of the Pacific, to answer through the columns of the Journal of Electricity such questions on the National Electrical Code as are of general interest.

Similar arrangements have been made with George E. Kimball, electrical engineer of the Industrial Accident Commission of the State of California, to answer questions on the Electrical Safety Orders issued by the Commission.

While it is the object of this department to assist in a better understanding of the Code and the Safety Orders, replies given are not to be considered as official interpretations applying in all instances, as some of the rules permit of varying interpretations under different conditions. The questioner should be guided by the inspection department having jurisdiction.

All who are interested are invited to send in their inquiries regarding the National Electrical Code to Claude W. Mitchell, Board of Fire Underwriters of the Pacific, Merchants Exchange Building, San Francisco, Calif., or to the Editor, Journal of Electricity, 883 Mission Street, San Francisco. Questions on the Safety Orders should be sent to George E. Kimball, Industrial Accident Commission, State Building, Civic Center, San Francisco, or to the Editor.

Q. 1. Are motor frames considered as satisfactorily grounded when connected to grounded rigid conduit through flexible metal conduit?

A. In many cases, yes, but in many other cases, no. If connected to circuits of over 300 volts, or if the motor rates more than 50 amp., it will be necessary to bond around the flexible metallic conduit. Order 711-8(b). For the size of the grounding conductor, see Order 704-5(d).

Q. 2. Is identified wiring required or only recommended?

A. The grounded conductor of all lighting circuits must be identified so that it may be located readily and connected properly at fixtures and lamp sockets. See Orders 702-1(y) and 703-11(d). This applies to new installations and additions to old installations.

Q. 3. If a branch circuit for a small 110-volt single-phase motor is tapped off a circuit having the grounded wire identified, should the motor branch circuit also be run with identified wiring?

A. Yes. This is one of the few cases where a motor is wired with identified wiring. However, it is not so important and in some cases might lead to confusion. If a portable cord is used between the outlet and the motor, to ground the frame of the motor as required by Order 711-8(a), this grounding conductor must not be connected to the grounded neutral. See Order 703-11(f).

Q. 4. Is "single-pole-fusing" required by the Electrical Safety Orders?

A. No. Single-pole-fusing must not be used except by permission of the inspection department having jurisdiction, and such permission is not granted until it is proved that the distribution system serving the installation is permanently, effectively and adequately grounded. Special cutout bases, panel boards, etc., are required. See Order 702-1(a).

New Adaptations of Reflected Lighting Equipment*

Reflector Equipment Has Been an Aid in the Progress Made in the Science of Artificial Illumination

By JAMES MUNDSTOCK, Manager, I. P. Frink, Inc., San Francisco

It is the aim of this brief paper to show how reflector equipment has helped in the progress of artificial illumination in more closely approximating sky-reflected daylight.

When we look back over the development of artificial lighting we find that up to the very end of the last century all lighting indoors was done by visible light sources. From the lighted torch in the dark cave, to the flickering wax candles in the palaces of kings throughout the middle ages, up to the time of the gas-clustered chandelier of the first half of the nineteenth century, the illumination of an indoor area was produced from visible fixtures. This should not surprise us when we remember that, prior to the event of electric light, artificial lighting was derived from open burning flames of fuel—such as wood, tar, wax, oil and gas.

With the ability to conceal our artificial light sources from direct vision, we may divide our lighting conditions as nature has divided hers. Outdoors we have direct sunlight, or reflected skylight of different intensities, or a combination of both. Indoors we may have direct illumination from brilliant chandeliers or reflected indirect lighting of various intensities from cornices, through glass diffusers, or we may have a combination of both.

In daylight the clear sky acts as a reflector of direct sunlight and the atmosphere surrounding the earth as its diffuser. In artificial lighting we likewise must have a means of controlling our light source, and in this manner our various types of reflectors have been devised.

Today we are convinced that reflector equipment will play an increasingly important part in the progress of artificial light towards a closer approximation of daylight. The history of reflector development is a very recent one, yet the demands for its improvement have been many. Without going into the different branches of reflector manufacture, I shall point out only a few of the more important demands.

First: The design of the reflector must be accurate in order to control the light output for a given condition.

Second: Reflectors must be made from materials which give a certain flexibility as to the size of the reflector. For some conditions it has to be extremely small, and for others as large as possible.

Third: On all types of reflectors which are wired at the factory easy means of installing and connecting the reflectors have to be provided.

Fourth: Greater demands on the means of mounting the reflectors under all sorts of conditions are constantly being made.

Fifth: In cases where reflectors cannot be concealed from direct vision demands have been made for means of diffusing the light sources thus reflected. In this way the different

kinds of diffusing glasses of which the pebbled and ribbed type are most prominent, have been developed.

Sixth: By far the most important feature of reflector equipment is the reflecting surface, and naturally the greatest demands have been made on its improvement.

While reflector equipment, from the beginning of its appearance, was designed and manufactured by persons or firms specializing in this work, it is to be regretted that among the general public as well as among many architects, reflectors are classified as lighting fixtures. It is to be hoped that all engaged in the development of better artificial lighting will make it a point whenever the occasion arises, to make the distinction between the two branches of the lighting industry, namely, the making of lighting fixtures and the making of reflectors.

While the designer of lighting fixtures is preeminently an artist, the designer of reflectors must be an illuminating engineer. Reflectors are an integral part of a building; chandeliers are a part of its decoration.

We may think of a chandelier as an object of art, the principal expression of which is illumination. We may think of a reflector only as a medium for the accomplishment of good lighting. It is true of course that reflectors may be designed to produce a certain artistic lighting effect, but in this case light itself is the object of art, and not the fixture.

In actual experience I have found that the most striking lighting results have been produced by a combination of visible and concealed lighting. This is especially true in large interiors.

When we consider the thousands upon thousands of years in which man has lived and developed in the open,

we find that our years of civilization and indoor life are like nothing in comparison. It cannot surprise us, therefore, that our physiological nature is still fundamentally the same. It demands that our light sources should come from above; it demands that the light should be variable. It needs different brightness and shades of light, but it also demands that the light source should be visible at times, and then again concealed. This is the principal reason why the lighting in a large interior such as a public hall is most pleasing when part of its source is visible and part unseen.

All of us who are devoting our life's work to the perfecting of artificial lighting may perform a great service to mankind. It consists in bringing our influence to bear upon architects and builders to regard the lighting as an integral part of the building and not, as is often the case, to regard it as an appendix to the finished job.

We shall see much progress in artificial lighting during the remainder of this century, and I believe the best work will be accomplished wherever the architect, the engineer and the manufacturer will work hand in hand toward the same aim, which is to make the world a brighter and happier place for mankind.

Electragist Opens Remodeled Store in Santa Ana

The Robertson Electric Company of Santa Ana, Calif., recently held the formal opening of its newly remodeled store. The upstairs portion of the store was remodeled entirely and a large basement was added.

The basement is arranged for attractively showing heavy-duty equipment such as electric ranges, air heaters, electric ironers and washing machines. The radio demonstration room is also located there.

The main floor is arranged for displaying smaller appliances and material and contains the general and private offices. In addition there are several fixture display rooms.



The Laurel Court in the Fairmont Hotel, San Francisco, after it was remodeled and a new decorative lighting system was installed. Irwin color filters replaced the old fixtures.

*Extract from a paper presented before the San Francisco Bay Cities Chapter of the Illuminating Engineering Society.

BETTER MERCHANDISING

To Feature One Appliance Each Month

Monthly Appliance Specials Adopted by N.E.L.A., P.C.E.A. and
Southern Electragists Co-operating with Edison Company

Doing one thing at a time, and that thing well, long has been regarded as an axiom. That it should apply to the selling of electrical appliances now is being made evident in several successful programs embodying that principle. No longer an experiment, that axiomatic truth will be applied during the forthcoming months with even more energy than before. A number of instances of this are to be noted in various sections of the West, and indeed the appliance committee of the Commercial Section, Pacific Coast Electrical Association, has centered its job for the year about this idea.

"Each month an appliance, and every appliance its month" well might be used to sum up the idea. The virtues of such a concentrated program are at once evident. Especially so is this true if all electrical outlets also concentrate upon the same appliance during the same period.

The combined effect of every electrical outlet for appliances featuring say, toasters for one month cannot help but result in increased toaster distribution for all who handle them. Every electrical contractor-dealer, every central station which merchandises or which advertises to assist its merchandisers, every department store or hardware store selling electric appliances—all these by advertising, billboarding, talking, displaying, featuring, and exerting special sales effort on one appliance, will act as a veritable barrage for that appliance's sale.

The idea is not an untried one. Several Eastern communities have used the method successfully. Some of the merchandising central stations of the Mountain states, one in particular of California, and one in Texas, have been known to use the plan and benefit from it.

What Some Companies Have Done

The Valley Electrical Supply Company, of Fresno, Calif., according to the report made in the last issue of the Journal of Electricity on merchandising results and programs for 1925-1926, (p. 102), used this idea to its satisfaction and plans to intensify it this year.

The El Paso Electric Railway Company, of El Paso, Texas, started the year 1925 with the idea, "1925—Make it Electrical," and followed it with a month-to-month program of appliance sales. To impress the public with its purpose to make the year electrical, it used effective window displays, put banners on its street cars and framed posters on its company automobiles

carrying its slogan. Each month was given its particular slogan and sales drive. Each month was assigned one

Special "Cash and Carry" Offer



\$3.75 is the complete purchase price of this **Durable Aluminum Percolator** 6 cup size, with ebony-like handle, complete with coffee basket and cord, ready to use.

By placing an unusually large order we can offer this percolator with a two year's guarantee at this remarkable price. Think of getting an electric percolator for the price of a plain coffee pot!

HOW YOU CAN GET ONE

1. CALL AT OUR OFFICE 2. SELECT A PERCOLATOR 3. PAY CASH \$3.75 4. CARRY IT HOME

SOUTHERN CALIFORNIA EDISON COMPANY

Envelope stuffer used by the Southern California Edison Company in its percolator special which led to the adoption of a monthly appliance feature sale in which the Electragists joined.

appliance to be featured, the program having been as follows:

January—One-Two-Three Sale.
February—Irons.
March—Kitchen Lighting.
April—Ranges.
May—Vacuum Cleaners.
June—Fans.
July—Fireless Cookers.
August—Percolators.
September—Washing Machines.
October—Lamps.
November—Air Heaters.
December—Christmas Sales on All Lines.

Although no final report on these campaigns has been made, it is known that each was found effective in the selling, not only of the particular ap-

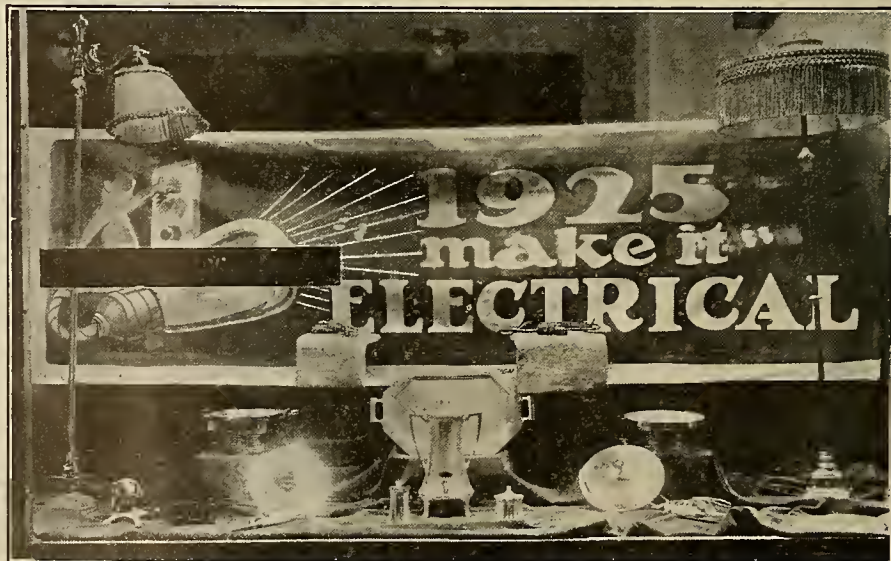
pliance featured each particular month, but of others as well. Customers buying the featured appliance often were sold other electrical merchandise as well, ranging all the way from spare fuse plugs or lamps to washing machines or ranges.

The value of such a campaign plan seems to lie in the prospects it produces for other business as much as in the particular appliance especially featured at the time.

P.C.E.A. Appliance Committee Plans Co-operative Campaign

In seeking to prepare some program for the year which would be of widespread value to the electrical merchandiser, the appliance committee, now known as the merchandising committee of the Commercial Section, Pacific Coast Electrical Association, set itself to a worthy enterprise in the planning for an all-year program of monthly or weekly features in merchandising appliances. The subject was discussed at each of the committee's sessions, and the tentative program as finally outlined stands as follows:

January—Following closely upon Christmas, Toasters.
February—Waffle Irons, on account of the extensive drive made by The Washington Water Power Company during that month, that was very successful.
March—On account of spring cleaning, Vacuum Cleaners.
April—In anticipation of summer heat, Ranges and Percolators.



At the beginning of its monthly program of specials the El Paso Electric Railway Company set out to establish 1925 as an Electrical Year. This window display was used in conjunction with street-car banners and posters on company automobile equipment.

May—On account of climatic conditions, Refrigerators and Table Stoves.

June—Because of June Bride Week, All Appliances, all the month.

July—Fans and Kitchen Ventilators.

August—Irons and Ironers.

September—Washing Machines, Hair Wavers and Curlers and Miscellaneous Small Appliances.

October—Ranges and Stand and Table Lamps.

November—Heating Week, Air and Water Heaters.

December—All Appliances All the Month.

While this program is only tentative, it shows consideration of such environmental conditions as weather, special holidays and events, and like activities.

It was proposed by the merchandising committee in its meetings that the program be perfected and then turned over to the California Electrical Bureau for execution, since the activities of the Pacific Coast Electrical Association have been considered to be of an investigational and advisory rather than of an executive nature.

Edison-Electragist Program Under Way

In conjunction with the California Electragists, Southern Division, the Southern California Edison Company has inaugurated a monthly special program for the first six months of 1926, and that campaign plan is already in operation. H. C. Rice, appliance sales agent of the Edison company, says of it:

"We have discussed the possibility of running a monthly special on some one appliance here in the south for some years, the matter having come before the Commercial Section of the P.C.E.A. several times. In the spring of last year the Southern California Edison Company undertook to run specials on irons and then on percolators, both of which were very successful. The local jobbers and dealers then became interested and through the medium of the merchandising committee of the Electragists, with the co-operation of the jobbers, we designated the month of October as Toaster month.

"Toasters were sold at a special price, which was approximately list, less 20 per cent. This special sale was quite successful, considering the short time in which we had to prepare for it, and, as a result, a meeting was called and a schedule of monthly specials beginning Jan. 1 was arranged as follows:

January—Air Heaters.

February—Toasters.

March—Ranges and Water Heaters.

April—Waffle Irons.

May—Percolators.

June—Irons.

"Since the above schedule was arranged we have received information from the N.E.L.A. to the effect that they are contemplating a similar series of specials to be run each month beginning with March, as that is the earliest time the advertising departments of the various manufacturers could prepare the necessary publicity. However, their schedule does not coincide with ours, as they have designated toasters for March and percolators for April, specials for the balance of the year to be decided on later.

"We are working very closely with the jobbers and the Merchandising Section of the Electragists to co-ordinate all plans on specials so that the entire industry in southern California will concentrate on the same device—not necessarily of the same make—at the same time."

March Is "Toaster Month" Throughout Entire U.S.

N.E.L.A. Sponsors Appliance Campaign; Several Sections Plan to Tie In with National Advertising

For March it will be toasters. This has been decided by the powers that be, if such exist, and with a national advertising effort to tie to, plans are being made in many sections of the West to make March a toaster month.

Sell Toasters on These Advantages

1. **Talk CONVENIENCE.** Never mind the construction of the toaster. It is the customer's convenience and comfort that you are selling, not YOUR toaster.

2. **SPEED** is an important factor in a busy life. The electric toaster will toast more quickly, and let the customer go on to her morning's work earlier and better satisfied.

3. **Less ATTENTION** required. No need to wait over a stove for toast, fearing it may burn, and having to give it constant attention. Toast is made right at the table as you need it with an electric toaster.

4. **DELICIOUSNESS** of electrical toasting is due to the toast being fresher, hotter, and served as wanted. The electrical toaster crisps the surface and keeps the toast mellow inside.

5. **CLEANLINESS** is a big item. An attractive nickel finished toaster is easily kept clean. Merely wiping it with a dish towel keeps it clean.

6. **APPEARANCE** sells many appliances. An electric toaster is something which a housewife can point to with pride. It is an attractive article of modern home furnishing.

7. **ECONOMY** is less important than any of the above reasons, but it figures in many cases. The saving in time and absence of burnt or spoiled toast is worth many times a toaster's cost. Its operating cost figured out per breakfast is also so low that it can be used effectively in sales.

8. **CONSTRUCTION** is an important feature to some folks, but it should be discussed only if asked for. Convenience, appearance and tastiness are more effective sales features. If construction is asked about, describe the toaster's guarantee, the workmanship, the reliability of the manufacturer and then its particular points of advantage.

BUT SELL CONVENIENCE FIRST.

The monthly feature idea has come into its own. Tried in various sections of the country and found a success, it has been adopted as a national policy by the N.E.L.A. merchandising national committee. Co-operating with the central-station companies, dealers and non-electric outlets, in placing electric appliances on the market, the manufacturers and jobbing organizations are planning to feature one appliance a month in national advertising. And for March that appliance will be the toaster.

Each manufacturer of course will feature his especial brand of toaster. And in the same way each dealer will feature the kinds of toasters he carries in stock, if he wants to tie in with the national advertising and program. The result should be that no store handling electric appliances, be it a central-station store, an electric dealer, a department or hardware store should be without its toaster display during March.

For results with toaster sales it would be a wise plan for any merchandiser to consider all effective ideas for the sale of such appliances and use those which suit his local conditions the best. The experience of others in this respect is valuable. For the purpose of aiding merchandisers in sales plans and ideas, there will be found in these pages several sales plans and ideas for the effective display, advertising, and more important still, **SELLING OF TOASTERS** during "Toaster Month"—March, 1926.

Acceptance Corporation Formed by Edison Officials

For the purpose of financing the installment sale of electrical and gas appliances by dealers and the merchandising departments of the public-utility companies, interests identified with the Southern California Edison Company have organized the Southwestern Acceptance Corporation, a Delaware corporation, with an authorized capital of \$2,000,000, seven per cent cumulative preferred and 40,000 shares of common stock. Both stocks have a par value of five dollars.

The new company will discount the installment contracts on appliances sold to consumers throughout southern California by appliance dealers and the Southern California Edison Company. The particular function of the company is to promote the sale of electrical appliances, including refrigerators, ranges, water heaters, ironers, vacuum sweepers and air heaters. Many dealers, it is explained, are unable to stimulate sales of electrical appliances by the installment method, because of lack of capital. The acceptance corporation is designed to supply the deficiency.

With the exception of Norman L. MacLeod, the president of the acceptance corporation, all the directors are affiliated with the Edison company. They are: John B. Miller, R. H. Ballard, S. M. Kennedy, Ben M. Maddox and Mr. MacLeod. The other officers are S. M. Kennedy, vice-president; Byron Fluno, secretary, and E. G. Miller, treasurer.

Toaster and Tray Make a Salable Combination

Appliance Campaign in Southern Colorado Built on Combination Offer at Special Price

Where an appliance by itself may attract only so many customers, it sometimes develops that the addition of a small article to it, making a combination offer, will give the resulting special much more selling power. Such at least was the experience of those in charge of an appliance campaign put on in the territory of the Southern Colorado Power Company last summer. A. R. Wooley, district manager of the Edison Electric Appliance Company in that territory, had charge of many features of the campaign, which was sponsored by the power company.

The sale was a three-appliance affair, and it was decided to encourage sales by means of a premium with each appliance. Toasters, irons, and percolators, were offered in this particular sale. With the toaster, of the turnover type, a 13-in. round tray, made of good quality heavy copper and well nickel-plated was secured at a good price. With the percolator a creamer and sugar bowl of good quality were secured. With the iron an ironing board was offered, and an allowance of a dollar was made on an old iron. Where no iron was turned in a credit of 50 cents was allowed to remove possible charges of partiality.

The toaster combination was as follows:

	List	Cost	Sell
Toaster	\$8.00	\$4.80	
Tray	4.00	.90	
Total	12.00	5.70	\$9.00

The percolator offer was arranged on a similar plan; a \$20 list-price combination costing \$10.20, was arranged to be sold at \$13.50. With the iron a \$10 list-price combination was offered at \$8.50, it having cost \$5.40.

Terms were arranged so that customers desiring them could buy any one offer at \$1 down and \$1 with each light bill until paid out. With the toaster a special effort was made to sell also the percolator offer. The percolator was shown with the tray used in the toaster offer, and the idea that a toaster was necessary to complete the set was used effectively to sell both appliances. To make this easier, no increase in down payment was asked, the payments being extended until the two offers were paid for.

Orders were solicited only from prospect cards made up on approved credit customers, so that the salesman calling was free to close each sale without worrying about credits. He also had the prospect's name, which furnished him with a good introduction. Orders were written up on a special blank provided for the purpose, made up in convenient pads.

Salesmen were paid commissions of \$1 on the toaster and iron offers and \$1.50 on the percolator offer. Half of the commission was paid on the following pay-day, the balance on the next following pay-day. This was done so that if repossessions were necessary, the commission could be deducted at the second period in case it had been full paid at the first pay-day. No repossessions were experienced, however.

Sample Cases Important in Making Appliance Sales

Designed for the purpose, the special sample cases used by the salesmen were responsible for closing many sales. They were made of beaver board, stained light brown, and decorated with the Hotpoint red man on each side. One side opened to allow

the salesman an opportunity to display his samples attractively.

The publicity given the sale consisted of a broadside and a limited number of newspaper ads. Mr. Wooley felt, however, that had more newspaper space been used, better results could have been obtained. Window displays played an important part in the sale. One window used large cut-out, flat replicas of the appliances on sale, painted with aluminum paint, and this proved so good that three sets were made up and used in each of the towns served by the company. Each of the individual district offices used window displays prominently in the advertising of the program.

Altogether about 500 appliances were sold in the campaign. The iron proved to be the best seller, with the percolator set next, but of the toasters 75 were sold by the power company and 112 by the Edison Electric Appliance Company.

Toaster Campaign Sells 1,000 Toasters in One Month

Last year 1,000 electric toasters were sold during a month campaign by the Valley Electrical Supply Company, of Fresno, or 300 more than it sold in the entire other eleven months of the year. Moreover those principles upon which the sale of toasters last year was conducted with such success are going to be developed by the Valley Electrical Supply Company this year for its toaster campaign in March, according to J. U. Berry, advertising manager of that company.

Beginning with an exceedingly attractive broadside, distributed from door to door, and followed up by liberal newspaper space and effective window displays, last year's sale proved that to feature one appliance at a time and to "hit" that one hard, would bring customers to the store in numbers, a great many of whom would be interested in buying other electrical goods.

Buying in quantity, a special feature price on account of quantity could be offered. Special terms, attractive to the buyer, were arranged for. The toaster was offered at \$3.95, with a down payment of \$1.95 and \$1 a month for two months to pay the balance.

The broadsides were printed on a book paper rather than the customary news stock common to dodgers. This, according to Mr. Berry, costs so little more that it is to be desired, for it places the campaign in a better class than one advertised on news stock.

A large, almost life-size, drawing of the toaster, with the price and terms prominently displayed, was made the center of interest on the broadside. Newspaper ads were almost as large, and consequently attracted as much attention as did the broadside.

The company had just closed an especially successful campaign on fireless cookers the month previous. To those who had bought a cooker a letter was addressed advising of the bargain on the toaster. This letter, too, was felt to have aided in the results achieved.

A new policy with regard to its special appliance sales is to be worked out by the Valley Electrical Supply Company this year. Being the merchandising agency of the power com-



Attractive window display used by Southern Colorado company in its three-appliance sale.

pany, the San Joaquin Light & Power Corporation, the benefits of the special appliance sale are to be made available to the customers of that corporation in small towns not immediately available to Fresno, the city in which the store itself is located.

Will Act as Jobber to Small Dealers in Outlying Districts

That the customer in the district may enjoy the benefit of the special price and terms offered the city dweller, the Valley Electrical Supply Company plans to act as jobber to the small town dealer for the sale of the featured appliance. The advertising done in the small country papers makes much of the fact that the featured toaster, for instance, may be bought at the feature price and terms from the local electric dealer. The dealer is sold the appliances upon such terms as will make it possible for him to handle such sales and benefit by them. This plan was put into practice in the waffle-iron campaign this month (February) and is expected to be used for other similar feature sales.

Feature Sales Stimulate Morale of Store Personnel

"We plan to take care of these feature sales with our regular staff," said a member of the company. He went on to say that the advertising and planning of a feature sale "pepped up" the sales force and made them feel that there was plenty of excitement at all times. Therefore, the extra effort in behalf of a sale is placed on the advertising. If, by putting on a feature event, a greater volume of business can be done without adding to the overhead or personnel, the effort is felt to be very much worth while.

Giant Toaster Makes Attractive Window Display

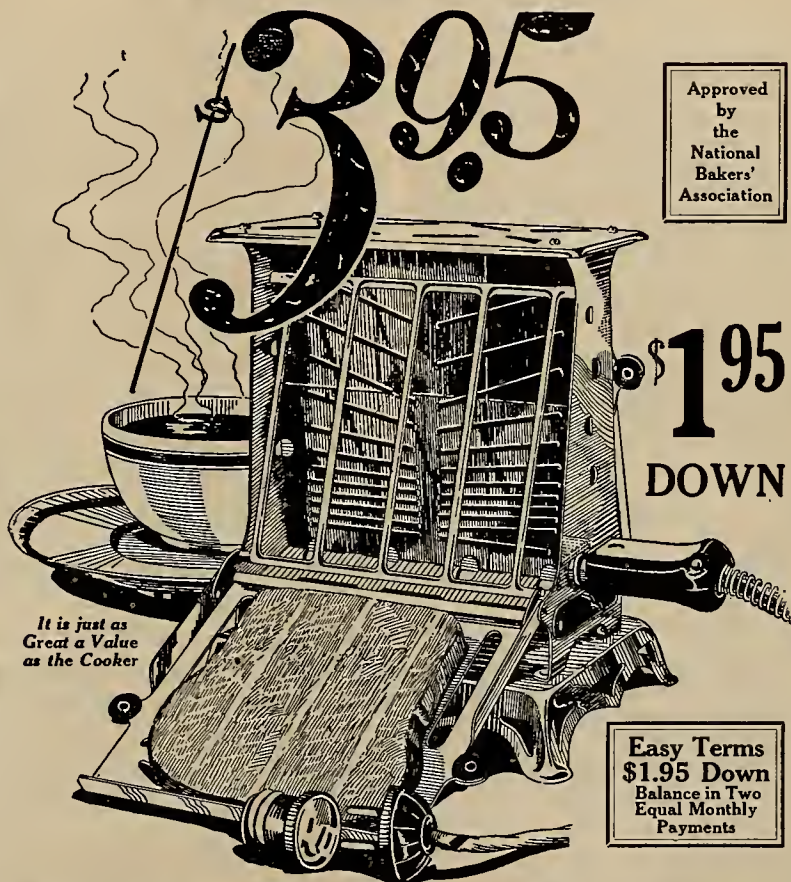
Striking an original note in window display, a feature of sales work for which the Valley Electrical Supply Company rapidly is gaining renown, the toaster campaign of last year enabled Mr. Berry to make an unusually effective window display with a giant toaster and equally giant slices of raisin bread toast. A model of the toaster on sale was fashioned out of wallboard and painted with aluminum paint. The front of the toaster was left down, and upon it was seen a large slice of raisin bread (which the San Joaquin Valley raisin growers are especially anxious to see on every table), nicely toasted, resting upon it. This toast was made ingeniously from a special loaf of bread, baked for the purpose by a local bakery. It was made in a large, flat loaf, about 3 ft. square. The crusts of the bread were removed by a single slice, and the resulting "giant" slice of raisin bread, about 2 in. thick, was placed in the oven and toasted.

To simulate the elements of the toaster, wound on sheets of mica, two sheets of glass were used, upon which the "elements" were painted. The entire toaster stood about 3 ft. in height and made so realistic an impression that it caused considerable comment. The same toaster is to be used in the March toaster sale this year.

Think of This!

A Giant Turnover ELECTRIC TOASTER

for only



It is just as Great a Value as the Cooker

Easy Terms
\$1.95 Down
Balance in Two
Equal Monthly
Payments

You have always wanted a good Electric Toaster Here it is at only half what you expected to pay

—We say that it is the best Electric Toaster we have ever seen, even at a far higher price —and you'll agree with us when you have compared it with others.

—Now imagine buying it for only \$39.50—at \$1.95 down and the balance in two equal monthly payments. You surely cannot afford to pass this opportunity by.

Delicious, Crispy-Brown Electric Toast

—The basis for making toast is heat, properly applied. This Electric Toaster concentrates and applies the heat evenly over the entire surface of the slice of bread, toasting it to an appetizing golden brown.

—Perfect toast should be done to a crispy brown surface with the moisture and freshness of the bread retained in the center of the slice. This can only be done with a red-hot flameless heat. That's the Electrical Way.

Takes the Largest Size Slice of Bread

—This toaster will hold a slice of toast from the largest size standard loaf of bread up to 4½ by 4½ inches. It is a flip-flop or turn-over type.

—This toaster is finely nickel finished, with heat insulated doors, crumb drop arrangement, equipped with hand-laced Chromel element, flexible cord, two-piece attachment plug and terminal connector. Built for lasting service.

It Toasts Correctly

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SUPPLY CO.
PHONE 3397 FRESNO SAN JOAQUIN POWER BLDG.

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NEWS OF THE INDUSTRY

Edison Company Proposes to Reclassify Authorized Capital Stock

Presenting to the 80,000 stockholders of the Southern California Edison Company a proposal for a reclassification of the several issues of its capital stock and the reduction in par value from \$100 to \$25 per share, John B. Miller, president of the company, in a letter to stockholders announced the approval of the company's board of directors to these changes, subject to ratification by stockholders.

In the proposal for a reclassification of the company's authorized capital stock of \$250,000,000 the amount of common stock remains the same at \$125,000,000, or one-half of the whole. The principal change is in the reduction of \$30,000,000 in the authorized seven per cent preferred stock series "A", and this is proposed to be accomplished by increasing the authorized six per cent preferred stock series "B" by \$10,000,000 and by the authorization of a new issue of five and one-half per cent preferred stock of \$20,000,000.

All stockholders will have the same ratable position as formerly, the company officials state, and the reduction in the amount of authorized seven per cent preferred stock, with the authorization of an increase in similar amount of authorized preferred stocks carrying a lower dividend rate, will have the effect of strengthening all classes of stock as well as securing for the company cheaper money for its future construction requirements.

The president's letter shows that as of Nov. 30, 1925, total outstanding capital stock of all classes was, \$109,994,700, which, it is understood, has been increased by several million dollars since that date by additional sales of stock to the public.

The proposed changes will take the form of an amendment to the articles of incorporation of the company which the stockholders will be asked to ratify at the annual meeting to be held in the company's offices on March 19 next.

In presenting the reasons why these changes are considered expedient, Mr. Miller says in part:

"The purpose of changing the classification of stock is to procure cheaper money in the future with which to finance our company's continually expanding development program. The proposed change is financially beneficial to all holders of stock now outstanding. It is believed that the change in par value of all stock from \$100 to \$25 will result in cheaper money, in that new shares of the lower par value can be sold for higher aggregate prices than shares of the former par value. Our board of directors also believes that the re-

duction in par value of shares will be of material assistance in the future extension of the customer-ownership plan of stock distribution inaugurated by our company in 1917. Since that time the number of stockholders has been increased from less than 2,000 to 80,000.

"Under the proposed amendment every present stockholder will be entitled to exchange the certificate or certificates he now holds for new certificates calling for four times as many shares of the same classification of stock at the lower par value; for example, a stockholder having a certificate for one share of Preferred stock, Series A, seven per cent of the par value of \$100 will be entitled to exchange it for a new certificate calling for four shares of preferred stock Series A, seven per cent of the par value of \$25, and so on, as to each kind of stock, both preferred and common."

San Diego Utility Plans Another Steam Unit and Substation

Expenditure of \$1,500,000 for increased generating capacity for Station B of the San Diego Consolidated Gas & Electric Company has been announced by the Byllesby Engineering and Management Corporation. This includes the new double-intake tunnel of approximately 1,300 ft. from San Diego Bay to Station B at Kettner Boulevard and E Street, a new 20,000-hp. steam turbine, additional boiler capacity and 6,000 kw. in transformer capacity, together with other auxiliaries. Installation of the new turbine will bring the capacity of this station to 47,000 hp. Work on the tunnel is well under way, and the transformers are scheduled for early delivery. This is the first part of the 1926 program, the remainder being as yet in a state of preparation.

One of the major projects will be known as Substation F, located between Boundary and Iowa Streets below El Cajon Boulevard. The capacity of this station, which will take care of the distribution for East San Diego, Normal Heights and Kensington Park territory, will be 3,750 kw. at 4,000 volts. It will cost in excess of \$100,000 for initial building and equipment, and present plans contemplate a material increase in its capacity and equipment within the next two years. Additional capacity at Station C is also under consideration.

The company already has surveys and plans for numerous extensions in the rural sections of San Diego County, particularly in its northern territory. The budget will include extensive ad-

ditions to the underground system in the commercial section of San Diego. Figures on these other improvements are not yet ready but will approximate the figures already given out for the major improvements at Station B, bringing the probable total of the 1926 budget to \$3,000,000.

Acquisition of Business Causes Formation of New District

The acquisition of the business of the Northwestern Power & Manufacturing Company, Port Angeles, Wash., of the Sequim Light & Power Company, Sequim, Wash., and of the holdings of the North Pacific Public Service Company at Bremerton, all on the Olympic peninsula, by the Puget Sound Power & Light Company, Seattle, (Journal of Electricity, Nov. 15, 1925, p. 393, Dec. 15, 1925, p. 466, and Jan. 1, p. 27) has made necessary the establishment of a new operating district, called the western district. Temporary headquarters were established at Sequim Dec. 1, 1925, to handle a portion of the business on the peninsula, and on Jan. 2 permanent headquarters were established at Bremerton with jurisdiction over all business on the peninsula. E. T. Steel, formerly manager of the southern district, has been appointed manager of the newly formed western district.

Other members of the organization are: C. F. Kirchhaine, acting assistant treasurer; F. H. Kerr, sales manager; E. R. Nigh, superintendent of light and power; W. F. Sachtleben, resident manager at Bremerton; J. L. Keeler, resident manager at Sequim; and J. M. Kinkaid, resident manager at Port Townsend.

The Puget Sound Power & Light Company has taken a lease on the entire lower floor of the Elks Building in Chehalis, and the executive offices of the southern district will be moved there from Portland as soon as the quarters can be furnished. Departments at Chehalis will include operating, construction, sales and accounting.

A. M. Chitty, formerly superintendent of light and power, northeastern district, with headquarters at Everett, has been named manager of the southern district. Frank Walsh, formerly superintendent of light and power, eastern district, succeeds Mr. Chitty as superintendent of light and power for the northeastern district.

Other personnel changes are announced as follows: G. H. George, formerly assistant superintendent, northern district, becomes superintendent of light and power, eastern district; W. A. White, until recently engineer, southern district, is now general superintendent of that district; and W. A. Schoel, who has been resident manager at Chehalis, has been made sales manager, southern district.

Los Angeles Plans Transmission Line to Boulder ; Arizona Threatens Years of Litigation

"Excepting the recommendation that the power be sold to the highest bidder," Los Angeles city council feels that the recent recommendation of Secretary of the Interior Work proposing the erection of a 550-ft. dam and a power generating plant is an endorsement of the project sought for some time and that while some minor points might be changed, "the committee does not feel them to be important enough to cause a controversy." Plans are being made, therefore, to have the Department of Water and Power make a survey of the cost of a transmission line, according to a recent newspaper report.

A resolution to have such a survey made was introduced by Councilman Randall, chairman of the Water and Power Committee of the council. He is reputed also to have said that he contemplates the placing on the ballot next November of a bonding proposition for the construction of such a transmission line to Boulder Dam.

Meanwhile negotiations to effect an agreement with Arizona on the development of the Colorado are known to be deadlocked again.

Senator Johnson and Representative Swing of California have accepted the plan of Secretary Work for the construction of the Boulder Dam project and for the building of the All-American canal. Arizona, however, has raised a strenuous protest against the "coercing of a sovereign state by the federal government." Senator Ashurst, Arizona's senior senator, has raised the point before the irrigation committee that the proposal to raise money by the sale of power makes the bill a revenue measure which under the rules must originate in the House. Some of the committee members are inclined to agree with that point of view. Senator McNary, the chairman of the committee, is not particularly friendly to the Work proposal.

On the House side Representative Hayden, of Arizona, has served notice that Congress will involve the Colorado River in litigation that will last for a generation if it passes the proposed legislation. He says that his state will enjoin any works started on the Colorado under any such plan.

There also is objection to the bill from those who are not concerned particularly with what may happen to Arizona. There are many who think the development of the Colorado should be undertaken by private capital. They think the Water Power Act should be let alone. Congress, after ten years of effort, sets up a water-power policy, they point out. The ink hardly is dry on the statute books until various efforts are set on foot looking to a different policy on the more important power streams. If these efforts are successful, it is contended, capital which has begun to flow into water-power developments will be withdrawn from such undertakings. There is nothing to justify the investment of the taxpayers' money in a business undertaking of this kind into which private capital is ready to go, these people maintain.

The point also is made that, since Arizona pays a portion of the taxes

which would be used in the construction of the proposed government project, it could not be denied the benefits of the development.

Another recent development of the situation is the feeling that the Pittman bill, which would suspend the authority of the Federal Power Commission to confer rights on the Colorado River or its tributaries, apparently has no chance of being considered by the House committee. Some of the senators who allowed the measure to get through the upper House now regret that they did not insist upon the consideration of the bill by committee. Consideration was not given to the fact that the suspension of the Power Commission's authority would bring to a standstill most electrical development in the entire Colorado basin. No transmission line over public lands could be authorized. No extensions of existing hydroelectric plants could be undertaken.

Announce Mokelumne Plant After Federal Commission Grant

The Federal Power Commission formally has approved the transfer to the Pacific Gas and Electric Company of a license for the development of water-power projects on the upper reaches of the Mokelumne River in Amador and Calaveras Counties, Calif. (Journal of Electricity, Nov. 1, 1925, p.351)

The license originally was awarded to J. W. Preston, Jr., representing Emory Winship, and trustee of the estate of Katherine Dillon Winship, deceased, owning a considerable tract of land along the banks of the Mokelumne River. The Pacific Gas and Electric Company has acquired these properties and accompanying water rights by purchase in order to provide additional storage facilities for its Electra power system in Amador County.

The original installation on the Mokelumne River was made primarily for supplying electric power to the mines in the Mother Lode section running through Amador and Calaveras Counties, but later, when the larger Electra plant was installed, the transmission lines were extended to Stock-

ton and thence to San Francisco so that the greater part of the output of Electra now is supplied to valley consumers, aiding in the prosecution of industrial as well as agricultural enterprises. The license now transferred will furnish the Pacific Gas and Electric Company additional water supply and a location for an additional power plant for the system.

Work is to be undertaken shortly that will involve the construction of a dam on the Mokelumne River at Salt Springs, approximately four miles upstream from the junction of the river with its principal tributary, the Bear. The dam site is at an elevation of 3,800 ft. above sea level. The dam itself will be 200 ft. in height, or rock-fill formation with concrete face, creating a reservoir of 60,000 acre-ft. capacity. The water will be conveyed by concrete-lined canal and tunnel along the northern slope of the stream a distance of 25 miles to Tiger Creek, and from that point will be dropped 1,200 ft. to operate a new power house of 40,000-hp. capacity.

New Transmission Line for Los Angeles Power Bureau

Work on a new transmission line for the Bureau of Power and Light, Los Angeles, between the central receiving station at North Main and Power Streets and the Harbor District at Wilmington where it will connect with the new substation for that district, a distance of about 26 miles, is to begin immediately, according to a statement issued by E. F. Scattergood, chief electrical engineer for the bureau.

Work on clearing up the right-of-way for this line has been begun and should be completed by April 1, at which time actual construction work on the transmission line is to start. The right-of-way varies in width from 100 to 160 ft. The line is to be operated at 110 kv., but is to be so constructed as to make it possible to raise the voltage to 220 kv. should future conditions make this necessary. The line will be built on steel towers with copper conductor. At the 98th and South Park substation there will be a tie-in with the Laguna Bell substation of the Southern California Edison Company, and at the Wilmington substation there will be a tie-in with the Long Beach steam plant of the Edison company.

Joint-Pole Agreement Made with Telephone Companies

Having as its object the increased use of joint poles by the utilities, an agreement has been entered into by the Southern California Edison Company and thirty southern California telephone companies whereby the Edison company will rent to the telephone company the right to use a pole rather than sell a half-interest in the pole as has been done heretofore.

F. V. Rhodes, telephone engineer of the California Railroad Commission, who was a member of a committee appointed by the commission to arrange for this agreement, is of the opinion that not only will this new system make for a more general application of the joint use of poles but will result in large savings in the making of extensions in the outlying communities.



Attractiveness of its buildings has been made a standard by the San Diego Consolidated Gas & Electric Company. The new La Mesa district office, recently opened, upholds the reputation of this company for buildings of an artistic character.

Expansion Program Announced by Electrical Manufacturer

The Electrical Products Corporation with headquarters in Los Angeles, has announced an extensive program of expansion. The capital of the company has been increased to \$1,000,000. The company has purchased the factory and business of the National Electric Sign Company of Oakland, Calif., and is doubling the size of the plant as a nucleus for Northern California production. A service and sales building is maintained in San Francisco and also in Oakland. Arrangements are being made to convert the present agencies at Seattle, Wash., and Denver, Colo., into integral parts of the company. Offices will also be maintained at Portland, Ore., and Salt Lake City, Utah. The existing business in Mexico City will be enlarged. The Los Angeles factory is being doubled in capacity.

The company has acquired the rights to manufacture Claude Neon illumination specialties which comprise outline lighting for buildings as well as electric signs, the light being obtained by high voltage discharge through exhausted tubes containing a minute amount of rare Neon gas. In addition to this the company will specialize in all forms of theatrical illumination and equipment.

The directors of the company include: John B. Miller, president Southern California Edison Company; George I. Cochran, president Pacific Mutual Life Insurance Company; Wm. L. Stewart, president Union Oil Company; W. I. Hollingsworth, realtor. The management of the company is the same as it has been: Paul D. Howse, president; John W. Harris, vice-president and treasurer; other vice-presidents in charge of various activities are: W. E. Joost, J. T. Northcutt, Tracy W. Simpson and J. E. Tucker.

William E. Joost was formerly president of the National Electric Sign Company which has been purchased. Tracy W. Simpson was in charge of the Pacific Coast business of the Federal Electric Company for the past ten years. The other officers have been with the Electrical Products Corporation for a number of years.

Work has been started on the new manufacturing unit for the company at Thirtieth Street and San Pablo Avenue, Oakland, Calif., by the Austin Company of California. According to the plans the new building will provide an additional 17,500 sq. ft. of floor space for the Oakland plant. This included the wrecking of struc-

tures now standing on the site and the erection of a building 75 x 125 ft. A paved yard 50 x 125 ft. is planned to expedite the handling of shipments, and a canopy shed 14 x 75 ft. will be constructed. The main structure will be of brick and steel construction with sidewalls of fenestra steel sash to give ample light and ventilation.

This unit of 17,500 sq. ft. is the second erected by this company during the past year. The two units, a total of 27,500 sq. ft. represent one of the largest sign plants in the West.

Western Man Receives Honorable Mention in McGraw Award

J. Robert Crouse of Cleveland, founder of The Society for Electrical Development, Inc., and more recently organizer of the Electric Refrigerator Manufacturers' Council, has been awarded the James H. McGraw medal for co-operation. This award completes the first of a series of four annual awards established by James H. McGraw to encourage individual initiative and creative thinking among electrical men (*Journal of Electricity*, June 1, 1925, p. 538).

The medal was presented at a dinner at the Waldorf-Astoria Feb. 8 at which many men prominent in the electrical industry were present. W. W. Freeman, president of The Society for Electrical Development, was chairman of the dinner committee and acted as toastmaster. Owen D. Young, H. L. Doherty, J. H. McGraw and J. Robert Crouse were among the speakers.

Of particular interest to electrical men of the West is the fact that a certificate of honorable mention has been awarded to Clyde L. Chamblin, president, California Electrical Construction Company, San Francisco, in recognition of his untiring efforts in the cause of the electragists in California who, as the California Electragists, comprise the largest state association of electragists in the United States. Mr. Chamblin is a member at large of the executive committee of the N.E.L.A. elected to represent the electragists. For the past three years and a half he has been a member of the executive committee, Association of Electragists, International, and a director of The Society for Electrical Development. He is also a member of the advisory committee of the California Electrical Bureau. In addition, he is a past president of the San Francisco Association of Electrical Contractors and Dealers, as well as a past president of the state association.

Dealer Merchandising Meetings Sponsored by Jobber

In an effort to bring about a better understanding of merchandising problems by electrical dealers, the Illinois Electric Company of Los Angeles is sponsoring monthly meetings at which these problems are discussed.

All electrical dealers and their wives are invited to attend a dinner preceding the meeting as the guests of the Illinois Electric Company. This is served in the cafeteria of the Westinghouse Electric & Manufacturing Company, in whose building the meetings take place.

The meetings are held on the third Tuesday of each month and are non-commercial in nature. The programs are in charge of the following committee: D. C. Pence, Illinois Electric Company; Walter Norton, Norton & Norton, electragists; J. A. Jamison, Westinghouse Electric & Manufacturing Company, all of Los Angeles; and J. J. Farley, Farley Electric Company, electragist of Fullerton.

Two window displays are set up in front of the hall in which the meetings are held. These serve as suggestions which may be used by the dealers. Some timely subject is discussed by a competent authority at each of the meetings, after which the floor is open for discussion of any problem.

"Present Day Merchandising" was the subject discussed by Harry Tuttle of the Parmelee-Dohrmann Company of Los Angeles at the January meeting, which was attended by 95 persons. Mr. Tuttle contrasted merchandising methods of today with those of a few years past and the corresponding advances made by co-operative associations.

He stated a merchant without fixed policies is like a ship without a rudder—he doesn't know where he is going; further, that the American business man has learned the power of co-operation, and that many stores fail because of a lack of co-operation rather than a lack of capital. He also spoke of the necessity of merchants keeping abreast of the times.

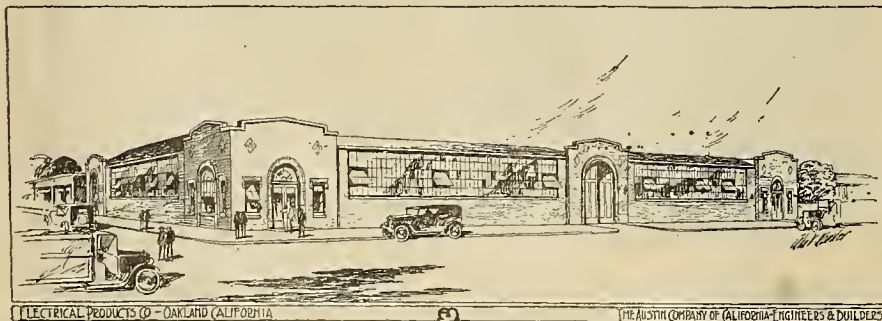
Electric refrigeration also was discussed in his talk. Mr. Tuttle stated that up to 1925 a total of 67,000 electric ice machines had been installed in homes in the United States. In 1925 250,000 were installed, and the quota for 1926 is 1,000,000 machines.

Jacobs Power Bill Defeated in Washington Senate

The Jacobs Power bill has been defeated in the Senate of the Washington State Legislature by a vote of 25 to 14. It previously had passed the House by a vote of 50 to 42. (*Journal of Electricity*, Jan. 15, p. 70.)

The measure provided that cities in the state be allowed to sell electric energy without their corporate limits, paying a tax of 5 per cent on all power sold.

Permit Granted for Hydroelectric Project in Wyoming.—Permit has been granted by the state of Wyoming to the Seminole Power Company for the construction of a hydroelectric power plant on the North Platte River, 40 miles north of Fort Steele, Wyo. Plans call for a dam 150 ft. high to form a reservoir of 700,000-acre-ft. capacity and a diversion tunnel 2 miles long.



New unit being erected for the Electrical Products Corporation in Oakland, Calif., by the Austin Company of California.

Portland Company to Install New 20,000-kw. Steam Unit

One of the principal items in the 1926 budget of the Portland Electric Power Company, Portland, is to cover the installation of a new 20,000-kw. Curtis steam turbo-generator at Station "L," the main steam plant of the company in the city. The order for this unit has been placed with the General Electric Company, and it is planned to have it installed before the heavy load of next fall comes on. This will be the largest and most economical steam unit on the system.

The generator is a type ATB-4, 23,000-kva., 1,800-r.p.m., 11,000-volt, 3-phase, 60-cycle machine, and is self-cooled by means of a closed system of ventilation utilizing 50,000 cu. ft. of cool air per minute. Direct-connected to the main shaft is a 135-kw., 1,800-r.p.m., 250-volt exciter. The turbine has eight stages and operates at a throttle pressure of 175 lb. per sq. in. with a temperature of 550 deg. F.

An interesting feature of the turbine is that while it is designed to operate at low pressure at first, using surplus steam from the present boilers at 175 lb. pressure, it readily can be changed to use a pressure of 385 lb. at the throttle. Such change in operating conditions is contemplated in the plans for expansion of this station in 1927 when the boiler capacity is to be increased. This change in the turbine will reduce the steam consumption from 11.85 lb. per kw-hr. to 9.8 lb. per kw-hr. at the most efficient point of operation.

Great Western Company's 1926 Budget Is \$11,558,000

The Great Western Power Company of California will spend during 1926 \$11,558,000 in the operation of its properties and for new construction projects, according to a statement made by J. B. Black, vice-president and general manager of the company. New construction work now in progress or to be commenced during the year is estimated at \$8,611,000.

Included in the major construction projects to be undertaken or completed during the year is the raising of the Big Meadows dam in Plumas County 45 ft. and its extension in thickness from 600 to 1,250 ft., increasing the capacity of Lake Almanor from 300,000 acre-ft. to 1,300,000 acre-ft. This work includes the construction of a large concrete spillway, an outlet conduit beneath the dam to permit the drawing off of water into the Feather River below and an electrically operated outlet tower. The cost is set at approximately \$2,000,000.

An additional \$2,000,000 is required for the construction of a 220-kv. steel-tower transmission line between Brighton substation, near Sacramento, and Merced, interconnecting the Great Western system with that of the San Joaquin Light & Power Corporation. This line will be 104 miles in length and will carry ultimately two three-wire circuits, operating at 220 kv., but initially will be operated with one circuit. The new Wilson substation, which will be built at the southern terminus of the tie line, will cost an additional \$700,000. This substation will be equipped with modern self-cooling transformers having a capacity of 60,000 kva. and a condenser whose capacity is 25,000 kva.

A new automatic substation will be erected at Isleton and interconnected with the company's two large substations at Brighton and Oakland. The cost of this substation will be about \$206,000. Transformers having a capacity of 9,000 kva. will be installed.

An extension to the present Fourth Avenue substation in Oakland and the addition of new transformers and switching apparatus calls for an expenditure of \$150,000, and the installation of an additional bank of transformers at Golden Gate substation will require \$50,000.

Miscellaneous additions and betterments to the company's distribution substations will cost \$1,350,000, and the construction of new distribution lines during the year throughout the company's entire territory is estimated at \$1,500,000. The new budget calls for an expenditure of \$2,947,000 for the operation of the company's production, transmission and distribution system, taxes, and commercial and new business activities.

During 1925 the Great Western Power Company added 5,000 new consumers to its lines, and now is serving a total connected load of 514,972 hp., representing an increase over the previous year of 45,000 hp.

San Joaquin Corporation Budget for 1926 Is \$12,372,000

An announcement made by A. Emory Wishon, vice-president and general manager of the San Joaquin Light & Power Corporation, Fresno, Calif., states that an operating and construction budget for 1926 of \$12,372,000 has been approved by officers of the Western Power Corporation and the North American Company, holding companies of the San Joaquin utility. (Journal of Electricity, Sept. 15, 1925, p. 222.) Mr. Wishon recently returned from New York where he conferred with officials of the two latter companies.

Of the amount set, \$2,789,000 is allocated to the Kings River hydroelectric development. Work is now under way on the Balch plant, the first powerhouse to be built on this project (Journal of Electricity, April 1, 1925, p. 241). In this plant, which will have an initial capacity of 33,000 kva., double over-hung impulse water wheels will operate under an effective head of 2,400 ft. The plant is scheduled for completion by January, 1927, and the cost is estimated at \$5,000,000.

Almost a million dollars is to be spent on transmission lines. Included in this is \$172,000, the cost of the 28-mile 110-kv. line to be built from Kerckhoff powerhouse to Sanger. This line will have 21 miles of steel pole and 7 miles of wood-pole construction. It is to parallel the present 110-kv. line and is to be rushed to completion to enable the corporation to meet the anticipated demands for additional power and service caused by the increase in the amount of acreage expected to be brought under cultivation in the San Joaquin Valley during 1926. A second transmission line, 12 miles in length, costing \$94,000, is to be constructed from Piedra to Sanger to transmit power to be generated at Balch powerhouse. Improvements and extensions of the distribution lines and equipment call for \$1,800,000, while approximately \$1,000,000 will be spent in the construction of substations throughout the company's system.

Submarine Cable Will Be Laid Across Puget Sound

Breaking all previous records, considering the combination of length, power capacity, voltage and depth of water to be traversed,—in some places over 750 ft.—the Puget Sound Power & Light Company, Seattle, has placed an order with The Okonite Company of Passaic, N. J., for 46,800 ft. of three-conductor submarine armored cable. This will be used to span Puget Sound between Edmonds on the mainland side and President's Point on the Olympia peninsula.

Connection then will be established with the properties which the Puget Sound Power & Light Company recently acquired on the peninsula. In order to assure continuity of service and an ample supply of power, two cable connections between the points will be made. Each cable will be 23,400 ft. long, each capable of carrying 10,000 hp. From President's Point a junction will be made with the existing high-tension transmission near Bremerton.

The cable will weigh about 15½ lb. per foot, or a total of approximately 750,000 lb. It will require nineteen carloads of cable, which will be delivered in lengths of 2,700 ft. There will be seven splices in each completed span. All of these will be made ashore, and each span lowered by means of a power hoist. It is expected that the cable will be delivered in May.

Power Project Contemplated on Cle Elum River, Wash.

A new \$1,000,000 power project for Kittitas and Yakima Counties, in the central part of Washington, is outlined in an application just filed with the state hydraulics department by Pearl E. Richards of 116 Perkins Building, Tacoma, as the Kittitas Power Company.

This project, to develop 8,000 hp. and utilize a fall of 94 ft., calls for the appropriation of 1,000 sec.-ft. of water from the Cle Elum River, and would require the construction of a concrete dam 95 ft. high at a point on the river now designated as Little Salmon Lasac.

It was indicated further that in this undertaking, for which Robert Young of Tacoma is to be superintending engineer, the flood water backed up by the dam would cover 331 acres and would entirely overlap Waptus, Fish and Cooper Lakes now in the area intended for use as a reservoir.

In the application it was stated that the power used would be carried by transmission lines to all cities and towns in a large radius, there to be used for lighting, heating, mining and for other industrial and domestic uses.

Puget Sound Utility Proposes Connection with Kittitas Company Lines.—The Puget Sound Light & Power Company through its Ellensburg, Wash., branch, proposes to build down the west side of the Yakima River from the South Cle Elum substation, through Thorp and connect with the line of the Kittitas Power & Light Company, extending its lines where there is sufficient business to justify the extension. It is planned that eventually the whole lower valley, exclusive of Ellensburg, will be given service by the Puget Sound company.

Profitable Committee-Section Conference Held by Rocky Mountain Division

That the first-hand discussion of problems and the mutual exchange of information is helpful in high degree was indicated at the recent committee and section conference of the Rocky Mountain division N.E.L.A., which was held for the first time at Idaho Springs, Colo., late in January.

While a certain amount of discussion is developed on convention programs the main vehicle provided by the organization officers is the individual speaker. Reports from the Idaho Springs conference indicate that the speakers served simply as leaders of discussion, which was predicated on surveys, investigations, reports and questionnaires. Because of the practical value of this material, both to large and small power companies, the results of the meeting, according to officials, will be reflected in the change of some established policies and the development of new ones.

Of chief interest in this line was the discussion on accounting policies affecting public relations as led by John E. Loiseau, secretary of the Public Service Company of Colorado and chairman of the division accounting section. As a result certain practices seemed advisable, such as to accept service applications by telephone, the contract to be signed later; to require a meter deposit of at least five dollars unless the applicant had established credit; and to eliminate the personal guarantor on the fact that the applicant was a property owner. When credit had been established, as in other commercial lines, or successful experience was obtained for at least one year, it was recommended that the deposit be returned with interest, covering, however, a period of not less than six months. While monthly billing was the accepted practice, it was pointed out that bi-monthly or even tri-monthly readings were working out satisfactorily, especially in certain rural districts.

J. A. Clay, general manager of the Western Colorado Power Company and chairman of the commercial section, headed the commercial program. Mr. Clay previously had attended the Commercial National Section meeting in Chicago and was also present at the range and rural lines committee meetings held in Salt Lake City early in January. G. B. Buck, of the Public Service Company of Colorado, outlined the necessary program for active central-station commercial development.

Due to the fact that all reports and committee meetings were held consecutively, every attendant was a party to all considerations. Non-technical men were interested auditors in the technical section presentation led by Harry Kerr of the Public Service Company. Overhead line crossing agreements with railroads were outlined, and it was the sense of the report that the power companies of the region, and in fact of the entire country, had been too easy in their relations with railroads on this matter, and a more equitable agreement was recommended. The effect of radio interference on the public relations of a central station was discussed, and the

methods employed by the Denver company to overcome difficulties in this line were reported. The test set employed to trace interference also was demonstrated. The income from radio both direct and indirect, was emphasized as sufficient reason for the incurrence of expense in helping to improve radio reception of customers, regardless of cause.

W. C. Sterne presided at the public relations session. Emphasis was given to the work being done by the Rocky Mountain Committee on Public Utility Information.

Higher wiring standards and the necessity for central stations assuming the lead in such community development was stressed by S. W. Bishop, chairman of the division wiring committee. Owing to ignorance and the absence of wiring regulations outside of metropolitan centers, the uniform ordinance was suggested for operation with the National Electrical Code. Several companies voluntarily offered to back movements in their territories looking toward the establishment of some kind of wiring inspection.

Preliminary plans for the annual division convention at Glenwood Springs next September were discussed. E. A. Phinney, head of the Jefferson County Power & Light Company, Golden, Colo., again was named general convention chairman with O. A. Weller, division secretary, as program chairman and Mr. and Mrs. John J. Cooper in charge of the entertainment.

All of the larger Colorado central stations were represented at the meeting and a large representation was present from both New Mexico and Wyoming. Charles A. Semrad, general commercial manager of the Public Service Company of Colorado, and president of the Rocky Mountain division, was the general chairman of the meeting.

News Briefs

Mountain States Power Company Buys Plant at Libby, Mont.—The Libby Water & Electric Company, Libby, Mont., has been acquired by the Mountain States Power Company, a Byllesby holding. It will be operated as part of the Mountain States company's system, which serves seventy-four communities in Oregon, Washington, Wyoming, Montana and Idaho.

Los Angeles to Spend \$6,000,000 for Ornamental Street-Lighting Systems.—More than \$15,000,000 will be expended in Los Angeles during 1926 in the erection of various municipal structures and city improvements, according to a report issued by the municipal art commission of that city. Of this sum approximately \$6,000,000 is to be spent for ornamental street-lighting standard systems and almost \$500,000 for additional buildings for the Bureau of Power and Light.

Electric Manufacturing Company Holds Sales Conference.—The Benjamin Electric Manufacturing Company, Chicago, held a three-day sales and advertising conference at its main office in that city Feb. 4-6. Sales plans developed and approved include an extensive advertising program for the fiscal year beginning April 1. Trade and class publications, national magazines and newspapers will be used as well as a complete schedule of direct sales promotion literature, with dealer, contractor and other selling helps. Miles F. Steel, manager, Pacific Coast division, San Francisco, was among those who attended the conference.

New Dispatching Center Installed by Southern California Edison Company.—A new dispatching center has been established by the Southern California Edison Company at its Vestal substation. A separate building has been constructed for the purpose of housing the dispatching office and equipment. This building is immediately in front of the main substation building, and its architecture conforms to that of the main substation building. The duties of the dispatching force located in the new building will be distinct from those of the operators at the substation. This new office will handle the San Joaquin Valley lines of the company and will relieve the central dispatching office in Los Angeles of many details.

Asks Franchise for Power Line from Crestline to Arrowhead Lake, Calif.—Fred D. Cats of Crestline, Calif., has filed a petition for a franchise to build a power line to extend from Crestline to Arrowhead Lake. The proposed line will run along the crest of the San Bernardino range and will serve the hundreds of cabin owners and resort operators in that territory. The Arrowhead Lake Company has its own power line, but Mr. Cats states that he has permission to extend his line into their territory. Mr. Cats has asked that the franchise run for fifty years. The Board of Supervisors of San Bernardino County is making an investigation of the request.

B.C. Company to Increase Storage Capacity at Jordan River Plant.—The British Columbia Electric Railway Company has announced that it will spend \$100,000 in increasing the storage capacity and in doubling the size of the flume at its Jordan River plant, at the southern end of Vancouver Island, so that it may be fully prepared in emergencies, such as the prolonged drought of last fall, when for several weeks it had to bring the auxiliary steam plant at Brentwood into service.

First Electrical Gold Dredge Put in Operation in Washington.—The first electrically driven gold dredge put in operation in the state of Washington has been installed by the Kittitas Mining Company on its property at Swauk Creek near Ellensburg. It will displace the hand labor that has been used in gold dredging in that section for fifty-six years. The dredge handles 5,000 cu. yd. of gravel in twenty-four hours and cost \$250,000. Three more electrically driven dredges will be installed by the company in the near future, C. A. Johnson, president, states.

Northwest Electric Light & Power Association

Many Topics Discussed at General Group Meeting of Accounting Section

Discussing the theory and practice of accounting methods with a view to developing material from which to compile final reports of the various committees, the Accounting Section held a general group meeting in Portland, Feb. 1, 1926. Forty odd members of the section were present. A resolution commending the section chairman, A. J. Johnstone, auditor, Portland Electric Power Company, Portland, on the excellent manner in which he conducted the meeting and directed orderly discussion was passed.

The meeting was opened by a report of the Stores and Purchasing Committee, read by J. S. Ruppe, general storekeeper, Puget Sound Power & Light Company, Seattle, in the absence of the chairman of that committee, F. W. Brownell, comptroller of the same company. The subject was, "Inventory of Material and Supplies," and this subject was narrowed down to a description of a suitable method of taking an annual physical inventory, pointing out some of the advantages to the accounting officer, and some of the uses to which the data collected might be put by other officers and department heads of the company.

Explaining that the fixed capital committee of this geographic division had been assigned by the national committee the subject of transmission and distribution line records, its chairman, J. A. Rockwood, valuation engineer, Portland Electric Power Company, Portland, presented a report outlining a process whereby the average cost of various units entering into the construction of these lines could be arrived at for the purpose of reaching a correct figure at which to retire any portion of the property when it was taken out of service.

The adaptability of machines to accounts payable records and payroll records, was the subject of a report read by F. H. Anderson, assistant treasurer, Puget Sound Power & Light Company, Portland, chairman of the Accounts Payable Committee. This report indicated that tabulating machines, with sorter, punches and cards were adaptable to handling a mass of data calling for various classifications, with accuracy, speed, and with less expense than is possible by hand.

The afternoon session was opened by a talk by F. L. Nagel, supervisor of credit department, Portland Gas & Coke Company, Portland, on the system of exchange of credit information as used by the Pacific Coast Gas Association. Under this system every applicant for service is asked of what other utility company he was last a customer, and an inquiry is sent to that company as to the status of his

credit with it. If the reply is satisfactory the customer is not asked for a deposit but is assumed to have established credit. Mr. Nagel stated that the use of this system by the Portland Gas & Coke Company had been influential in keeping credit losses at a minimum. The subject was widely discussed, and consensus of opinion indicated that the system should be adopted generally among utility companies and that it would work. The public relations aspect of the question was touched on by D. J. Torrence, assistant to comptroller, Puget Sound Power & Light Company, Seattle, who urged that any system which successfully could replace the deposit system would generally be appreciated by the company's customers, to the benefit of the company's relations with those customers.

In lieu of a regular report from the Statistical Methods Committee by its chairman, W. H. Hawkes, Puget Sound Power & Light Company, Olympia, Wash., who was absent, D. F. McCurrach, rate and valuation engineer, Northwestern Electric Company, Portland, member of the committee, gave a talk on the application of charts and curves to statistical reports. As an added contribution on the general subject, W. L. Fitzpatrick, general auditor, Mountain States Power Company, Tacoma, read a company report outlining the organization and work of the statistical division of the Northern States Power Company, a sister company to his own.

At this point, the regular program having been completed, the meeting was thrown open for a discussion of any subject desired. During the entire meeting discussion was widespread and spirited. Beside those already mentioned the following contributed informative material leading to the crystallization of opinion: H. L. McPherson, engineering accountant, Puget Sound Power & Light Company, Seattle; B. H. Parkinson, cost accountant, Portland Gas & Coke Company, Portland; M. J. Wilkinson, assistant secretary and assistant treasurer, Pacific Power & Light Company, Portland; I. D. Murfield, balance of stores clerk, Portland Electric Power Company, Portland; J. G. Hawkins, engineering accountant, Pacific Power & Light Company, Portland; A. D. Brown, chief clerk, central district, Puget Sound Power & Light Company, Seattle; C. P. Milne, credit man, Portland Electric Power Company, Portland; F. S. Grutze, credit man, Northwestern Electric Company, Portland; W. N. Ringrose, chief clerk, southwestern district, Puget Sound Power & Light Company, Tacoma; B. E. Lee, division auditor, Mountain States Power Company, Albany, Ore.; M. A. Preisz, auditor

Eastern Oregon Light & Power Company, Baker, Ore.; and L. E. Hinman, assistant valuation engineer, Portland Electric Power Company, Portland.

Feb. 18-19 Set for Group Meeting of Commercial Section

A group meeting of the Commercial Section of the Northwest Electric Light and Power Association will be held in Spokane, Feb. 18-19 at the Davenport Hotel, according to announcement of P. M. Parry, commercial manager, Utah Power & Light Company, Salt Lake City, and chairman of the section.

Representatives of all branches of the industry—manufacturers' agents, jobbers, contractors, central station men—have been invited to attend, and it is hoped that a representative of the Commercial National Section will be present. Many suggestions which cannot be considered in a general session will be discussed, and the chairman is anxious to have a full attendance at the meeting.

Women's Committee Meeting Has Home-Lighting Program

More than sixty-two women attended an interesting meeting of the Women's Committee of the Northwest Electric Light and Power Association held at Spokane, Wash., on Jan. 19, when W. R. Matthews, illuminating engineer of The Washington Water Power Company, presided at a program on home lighting.

The company's assembly room was arranged to show the proper methods of illuminating a dining room, living room and kitchen. Mr. Matthews demonstrated the types of fixtures, and with the use of a shadow box holding a bust of Shakespeare showed the effect of light thrown from different directions. He also illustrated by means of a speed-of-vision machine arranged in the form of a drum the effect of proper light upon the vision.

Industrial Lighting Competition Prizes and Judges Named

The industrial lighting committee of the National Electric Light Association next spring will award three prizes to the three electrical leagues or electric service companies which, in the opinion of that committee, shall have done the best work along the lines which the committee is promoting. The period covered runs from Sept. 1, 1925, to March 1, 1926. Reports must be in the offices of the committee at N.E.L.A. headquarters in New York by April 1, 1926. The prizes are for \$2,500, \$1,500 and \$1,000, respectively, and the winners will be announced at the N.E.L.A. convention at Atlantic City in June.

The judges selected are: chairman—Earl E. Whitehorne, commercial editor, Electrical World, New York; James E. Davidson, president, National Electric Light Association, and vice-president, Nebraska Power Company, Omaha; Edward W. Lloyd, chairman Commercial Section, N.E.L.A., and general contract agent, Commonwealth Edison Company, Chicago; Dugald Jackson, professor of electrical engineering, Massachusetts Institute of Technology; and Merritt Lum, vice-president, A. W. Shaw Company, Chicago, publisher of Factory.

Pacific Coast Electrical Association

Advertising Section Reorganizes at Fresno Meeting

When the committee on standards of the Advertising Section, P.C.E.A. made its report to the section at its meeting in Fresno, Feb. 5, the section adopted that committee's recommendation for a new form of organization and immediately placed itself under it. Action was taken after considerable discussion of the new organization form proposed.

Declaring that it was necessary for the Advertising Section to define concisely its scope of activity with respect to the Public Relations and the Commercial Sections, and recommending that a permanent and yet flexible organization be adopted and incorporated in a code book, the standards committee's report brought forth much discussion. It was presented by Ben Allen, chairman of the committee, and read by W. A. Cyr, a member of the committee.

The new organization form proposed and adopted calls for an executive committee consisting of the section chairman, the vice-chairman and the past chairman, the latter provision to enable a continuous policy to be pursued. Under this plan Dan Scott, Los Angeles Gas and Electric Corporation, chairman; M. S. Scanlon, Westinghouse Electric & Manufacturing Company, vice-chairman; and Al Joy, San Joaquin Light & Power Corporation, past chairman, constitute the new executive committee.

This committee is charged with the assignment of subjects for study and papers, the assignment being made whenever subjects requiring consideration are brought to its attention. This organization does away with a superstructure of committees and subcommittees, and assigns to individual members of the section the responsibility of getting up papers on subjects assigned them, giving them the liberty to call on any other member of the section for advice and assistance.

The new organization also calls for a standards committee to act in a judiciary and advisory capacity, passing upon such changes to the organization or standards of practice of the section as are required in the light of the code to be established by it and submitted to the section for approval. Impartial judgment of the value of questionable advertising media is also to be undertaken by this committee. Its personnel consists of three members, one appointed each year, the senior member being chairman. This plan was adopted in order to give continuity of policy and interpretation to the section's code. Ben S. Allen, Key System Transit Company, was appointed senior member and chairman of this committee, Wm. A. Cyr, Journal of Electricity, two-year member, and J. Charles Jordan, Pacific Gas and Electric Company, the three-year member of the committee.

A third committee, on information, was named in the new organization, with Frederick S. Myrtle, Pacific Gas and Electric Company, as chairman.

The next meeting of the section will be in San Francisco, April 3, at which time the standards committee is to report in full as to the code it proposes for the section.

Members Must Notify Secretary of Address Changes

All members of the Pacific Coast Electrical Association are not only requested but urged to advise this office of any change of address so that our lists may be absolutely correct and up-to-date. Members should likewise inform us immediately of any and all changes in the future. If members will only let us know when they move or change their address, there would be fewer Journals returned by the post office department and it would simplify the problem of mailing out the books of Proceedings, as well.

SAMUEL H. TAYLOR,
Secretary.

Coast Well Represented at the Kansas City Meetings

Eight delegates from the Technical Section of the Pacific Coast Electrical Association attended the group meetings of the Technical National Section in Kansas City, Feb. 9-12. But for the illness of L. J. Moore of the San Joaquin Light & Power Corporation the total number would have been nine. J. G. Rollow, vice-chairman of the P.C.E.A. Technical Section, attended the meetings of the underground and the apparatus national committees and acted for R. R. Cowles, chairman of the P.C.E.A. Technical Section, who was unable to go East for these meetings. R. G. Jones, chairman of the P.C.E.A. meter committee, attended the meters and accident prevention national committee meetings; J. C. Gaylord, chairman of the P.C.E.A. apparatus committee, attended the meetings of the apparatus and the hydraulic power national committees. Clinton de Witt represented Walter Dreyer, chairman of the P.C.E.A. hydraulic power committee, at the meetings of the national committee of that name. F. G. Philo attended the national prime movers committee meeting in the place of J. W. Andree, chairman of the P.C.E.A. prime movers committee. Others attending from the Coast were H. Michener and R. J. C. Wood, of the Southern California Edison Company, who are members of the national overhead systems committee, and H. H. Buell, secretary of the P.C.E.A. underground systems committee, who attended the meetings of the national underground and the national inductive co-ordination committees.

This delegation gave the Pacific

Coast an excellent representation at the group meetings where they took full part in discussions and activities. The P.C.E.A. Technical Section thus had a representation of two members on each national committee, except the overhead committee where the representation was three.

Transportation Section Outlines Activities at Meeting

Maintenance, operation and practices relative to transportation vehicles of utility companies are the major problems to be considered by the Transportation Section of the Pacific Coast Electrical Association, as outlined by S. B. Shaw, chairman, at the meeting of the section held at the office of the San Joaquin Light & Power Corporation in Fresno, Jan. 29-30.

It is planned to prepare a summary of practices as followed by member companies. Papers will be prepared on the following subjects: tires, body design and selection of equipment, repair shop methods, lubrication, garage design, records and accounting, power equipment, educational methods, and electric trucks.

The electric truck committee, a subcommittee of the Commercial Section of the P.C.E.A., has for its work the consideration of the commercial aspects of the electric truck. In view of this fact the Transportation Section will consider gas vehicles in the majority of its papers; however, it will consider the maintenance and operation of the electric truck.

The next meeting of the Transportation Section will be held in San Francisco, April 23-24.

Additional Reports of January Technical Conclave

Electrical Apparatus Committee

J. C. GAYLORD, Southern California Edison Company, Los Angeles, Chairman.

Considerable attention was given to the trend of Pacific Coast practice in substation design. Several papers on this subject were read and discussed. Standardization of general substation layout was evident in the designs adopted by the various operating companies. One company representative described a layout which permits the gradual expansion by successive steps of a small rural station fed at 70 kv. and supplying one or more 11-kv. feeders to a station fed by one or more 110-kv. lines and supplying a 70-kv. network and several 11-kv. feeders. This was accomplished by designing the original installation with expansion in view of utilizing standard structures and equipment.

There also was a tendency shown in all the papers to get away from the installation of large storage batteries in outlying stations with their attendant high initial cost and high upkeep. Two of the operating companies are using air control of oil circuit breakers, air compressors being operated from small storage batteries of from 13 to 32 volts. One company is using a motor-operated spring mechanism running on a 24-volt storage battery.

A paper describing the new Wallenpaupack hydroelectric development of the Pennsylvania Power & Light Company was read and discussed. This

project contrasts markedly with practice on this coast. Power generated at the Wallenpaupack plant by two 25,000-kva. generators is transmitted at 220 kv. for only 65 miles before being stepped down. This hydro plant is designed as a peak-load plant for a 25 per cent annual load factor, the base load being carried on steam.

In discussing oil circuit breakers the danger of over-investment in this class of equipment was pointed out. This may be avoided by specifying switches capable of rupturing short circuits under average probable conditions rather than the maximum currents obtainable. In order to secure more dependable information on the behavior of various makes and types of switches in actual service an extensive survey covering the actual performance of their breakers is now being carried on by all of the member companies.

A joint session was held with the overhead systems committee and the safety rules committee at which were discussed problems of common interest, including grounding and the adoption of standard distribution transformer ratios. It was pointed out that, in the recommendations of the subcommittee of the national apparatus committee which studied this matter, no provision was made for the inclusion of a 4-kv. class of transformers. Also it is desirable that transformers be included of such a ratio that they may be used for single-phase service on a star-connected distribution system and give the same secondary voltage when connected across phases as that given by a star-connected three-phase bank. It was recommended that these facts be brought to the attention of the national subcommittee.

Inductive Co-ordination Committee

H. N. KALB, San Joaquin Light & Power Corporation, Fresno, Chairman.

Recent inductive co-ordination cases were discussed. Of particular interest was the proposed 104-kv. Manteca-Salinas line being constructed by the Pacific Gas and Electric Company, lessee of the Sierra & San Francisco system. Through Pacheco Pass some high elevations are encountered. Therefore in this section flat construction is interspersed with triangular (wishbone) construction. This offers unique problems in the arrangement of transpositions.

F. E. Chapman, Pacific Gas and Electric Company, San Francisco, reported by letter on the national committee meeting held in Detroit in October. The outstanding points discussed at those meetings were joint use of poles, radio interference, space radio wave bands and the new systems of automatic train control. In discussing the latter feature, L. J. Corbett, Pacific Gas and Electric Company, San Francisco, stated that he had found that none of the roads in the local territory yet were installing the "continuous inductive" type which is the most susceptible to outside influences. The "intermittent inductive" type is being installed most generally and is not affected particularly by stray induction.

Radio interference was the subject of written and verbal reports and discussion. A paper by J. J. Jakosky, Western Precipitation Company, Los Angeles, relating particularly to in-

stallations of Cottrell precipitation apparatus was quite comprehensive. It was questioned whether the superheterodyne set after all was the best set to use for locating faults causing radio interference as the three-tube regenerative set with broader tuning is satisfactory in most cases. The advantage of the superheterodyne is that it is as sensitive as the best sets of the complainants while the three-tube set may not detect the troubles complained of by owners of the better sets. The desire for accurate costs of radio interference detection and correction was stressed although the difficulties of the accounting were appreciated.

Wire communication was reported upon and discussed. This involved methods of protection and transposition and maintenance of "hot" and "cold" telephone lines. Acoustic shock suppressors of the vacuum tube type are used to some extent by the San Joaquin Light & Power Corporation and by the Southern California Edison Company with evident success. The latter company reported use of telegraph signals which are utilized between phantom and ground on certain lines. The Southern Sierras Power Company uses the phantom for this purpose.

Carrier communication on power wires is in use by the Bureau of Power and Light, the Great Western Power Company and the Pacific Gas and Electric Company, the latter two having equipment made up on the ground and the former using Western Electric equipment. The Pacific Gas and Electric Company's set is simplex in operation and thus not ideal for the service desired. Therefore a trial is to be made of the products of three different companies of which the one found to be best suited for the conditions will be retained. None of the western companies is using carrier current on telephone lines.

The matter of supervisory control, just taken up by the committee, was discussed. A joint committee between the inductive co-ordination and apparatus committees will be appointed to investigate and report on this subject.

Company Allowed to Change Pit River Development Tunnel

Permission recently granted by the California Railroad Commission to the Pacific Gas and Electric Company, San Francisco, to change its tunnel plans for its additional Pit River developments will result in securing more favorable dam sites and power-house sites for plants Pit 4 and Pit 5 and in shortening the length of Pit 5 tunnel by 1½ miles. Under the original plans the Pit 5 plant would have required a 7-mile tunnel.

Other advantages, according to a statement issued by the company, are that more water will be available for power generation through Pit 6 plant from several tributary streams which enter the Pit below the Pit 5 diversion; that the head of 595 ft. on Pit 5 will permit of the use of the most efficient type of reaction turbine, whereas the head of 980 ft., as originally planned, would have necessitated the use of impulse wheels; and that power may be developed in blocks more nearly suited to meet the growth of the company.

"What Price Light" Given First Performance at Sacramento

"What Price Light," a realistic playlet prepared by the Industrial Lighting Committee, N.E.L.A., was given its first Western performance at the regular meeting of the Sacramento Valley Electrical Society Jan. 13. The performance was sponsored by the northern division, Pacific Coast geographical division, of the Industrial Lighting Campaign, headed by C. D. Montieth and H. H. Allison, vice-chairmen.

The cast was made up from members of the San Francisco chapter of the Illuminating Engineering Society. Robert St. John, of Simonson & St. John, consulting engineers, played the part of the Factory Superintendent, harassed by low production, high spoilage, and many accidents in his poorly lighted plant. His Plant Electrician, satisfied with a 60-watt lamp over every machine, was played by O. K. Jones, of the Great Western Power Company. The Breezy Salesman, who tries to load the superintendent up with a trick lighting fixture, using high-pressure methods, was played by W. A. Cyr, of the Journal of Electricity. The Engineering Salesman, who shows all the salient facts about lighting and sells a true lighting service, was played by Leo Gianini, Edison Lamp Works.

The playlet was produced in San Jose Feb. 4 before the Santa Clara Valley Electrical League and will be given in San Francisco before the San Francisco Electrical Development League on Feb. 15.

A.I.E.E. News

Los Angeles Section has a "triple-header" for the regular meeting to be held March 2, 1926, at the banquet hall of the L. A. Creamery at 1120 Towne Avenue. All three speakers are members of the Southern California Edison Company's staff. N. B. Hinson, planning engineer, is to speak on "Forecasting Growth of Population, an Aid to System Planning;" E. R. Stauffacher, protection engineer, is to tell of "Application of Protective Equipment to Electric Transmission Systems;" and F. G. Philo, superintendent of steam generation, is to give a review of the "Progress in Steam Generation of Power and the Mercury Turbine."

San Francisco Section. Feb. 26 meeting will be addressed by P. J. Ost and N. A. Eckhart, of the engineering department of the city of San Francisco, who will discuss the Moccasin Power development. The meeting will be held in room 251 at the City Hall and will be preceded by a group dinner at the Whitcomb Hotel at 5:45 p.m. An interesting evening is assured.

Farley Osgood, past president of the Institute, has announced that a portion of his time now is available as a consultant on the design, construction, operation and interconnection of public utilities. Mr. Osgood will have offices in the National Bank of Commerce Building in New York City.



News of the Electragists



Throwing string confetti on board the boat bound from the Catalina convention of the Electragists. From left to right: Victor Lemoge, San Francisco; Harry Walker (president of the California Electragists), Los Angeles, and Frank McGinley, Wilmington.



Some of the men in attendance at the Catalina convention enjoyed a little fresh air in the grounds of the Hotel St. Catherine while waiting for the general meeting to convene. The smiles are evidence of the enjoyable time they are having.

Plans Outlined for State-wide Meeting in Denver Mar. 26

A state-wide meeting, primarily intended for contractors and dealers of Colorado, but with the support of the entire industry, is scheduled to be held in Denver March 26 under the sponsorship of the Electrical League of Colorado.

Following the practice of other Western leagues, the idea of holding a one-day convention has been developed in order to bring all branches of the industry together and especially those agencies not directly identified with existing organizations, according to A. C. Cornell, chairman of the league.

The program committee, headed by L. M. Cargo, intends to have one or more speakers of national reputation and other interesting features that will insure a large attendance.

W. A. J. Guscott, president of the Denver Electrical Contractors Association and a vice-chairman of the league, is head of the committee promoting a good attendance for the meeting. The contractors plan to have a round table luncheon discussion of their problems. A banquet with special entertainment will be featured at night.

Although formal invitations will not be issued notices will be sent to all of the electrical men in Colorado and in case any do not receive proper notification, officials of the league want every electrical man to feel that he is invited. While the meeting is primarily intended as a Colorado affair, it is hoped that representatives from Wyoming and New Mexico and other Western states will be present.

Bureau Sponsors Meeting of Contractors and Inspectors.— Interpretations of the National Electrical Code were discussed by the city inspection department and the electrical contractors of San Diego at a meeting sponsored by the California Electrical Bureau. At this meeting plans of closer co-operation between the various contractors and the inspection department were laid, and arrangements were made for holding weekly noon-day meetings of the two groups to discuss Code rulings and other subjects. The first meeting was attended by Harry N. Beecher, chief electrical inspector of Los Angeles, and James H. Evans, engineer of the Board of Fire Underwriters of the Pacific.



Clyde Chamblin will receive a certificate of honorable mention in connection with the James H. McGraw Award given "to encourage constructive thinking for the advancement of the electrical industry." This certificate has been awarded to Mr. Chamblin as a recognition of his work in extending the electragist movement to the State of California and also for his efforts in promoting the state-wide organization of the California Electragists, which is the largest state organization in the United States. Unfortunately Mr. Chamblin was unable to attend the presentation dinner given in New York Feb. 8 at the Waldorf-Astoria and so Joseph E. Fowler, president of the Association of Electragists, International, acted as his proxy. Mr. Chamblin is the proprietor of the California Electrical Construction Company of San Francisco.



Northwest Association of Electrical Inspectors, Portland, Ore., Jan. 12, 1926. The two gentlemen in the center, evidencing the spirit of co-operation that permeated the convention by advertising the balmy quality of Portland's weather on that midwinter day, are H. A. Patton, Seattle, and George C. Hixon, Port Angeles, Wash.

Meetings

Red Seal Activities Main Topic at Bureau Meeting

Red Seal activities occupied the greater part of the time and attention of the advisory committee of the California Electrical Bureau at its meeting at the Jonathan Club, Los Angeles, Jan. 21.

After the meeting had been called to order and minutes of the last meeting had been duly approved, W. L. Frost, chairman of the finance committee, made a statement to the effect that arrangements for providing funds for the business of the Bureau were proceeding satisfactorily and responses were coming in rapidly.

The chairman made a report on the status of plans for the prosecution of Red Seal activities, giving the results of his conference with W. L. Goodwin and F. M. Feiker of the Society for Electrical Development in New York City December last.

After a careful study of ready-made material which had been prepared by the Society for Red Seal activities, it was found that the greater part of it was inapplicable to meet the conditions involved in the state-wide organization in California. Suitable material for California use therefore was prepared by the Bureau staff, including a complete manual in mimeograph form, copies of which were submitted to the committee for inspection. It was reported further that orders had been placed for the necessary forms and printed material and that deliveries to district chairmen would commence about Feb. 1, when the Red Seal Plan would be ready to be put into effect without further delay.

Various suggestions were offered as to devising ways and means of giving premiums or awards of some nature to the district which made the best showing. These various plans were taken into consideration in order that they might be reduced to some practical working form.

The chairman was authorized by the board to employ F. J. Kiefer for service in the northern section of the state in furthering the objects of the Red Seal Plan.

During the afternoon session the question of advertising and publicity was taken up for discussion. The chair was authorized to appoint M. W. Scanlon, of the Westinghouse Electric & Manufacturing Company, as general chairman of the advertising committee with the recommendation that he build up his committee personnel using as a nucleus the advertising committee of the Pacific Coast Electrical Association, and be prepared to submit a detailed report at the next meeting of the advisory committee as to the form his committee's activities would take.

The report of the auditor on the books of the bureau was submitted and approved.

Frank J. Airey spoke of the opportunity afforded by contact with the Architectural Club in Los Angeles in

order that the assistance of the bureau might be utilized in laying out wiring diagrams for publication in its books of floor plans. Similar contacts will be established with manufacturers of ready-cut homes and others engaged in the same line of business.

A discussion was held as to ways and mean of making an accurate survey of the number of electrical homes in the state of California to be published later in pamphlet form for the purpose of showing the people at large the degree to which the all-electrical home idea had penetrated this state and for the purpose of removing the bugbear of excessively high operating cost, which has acted as a stumbling block in the progress of this movement.

The meeting then adjourned to enjoy the hospitality of the southern members at a dinner served in the rooms of the new Jonathan Club.

COMING EVENTS

Commercial Section, Northwest Electric Light & Power Association—

Group Meeting, Davenport Hotel, Spokane, Wash.
Feb. 18-19, 1926.

Technical Section, Northwest Electric Light and Power Association—

Annual General Meeting—Seattle, Wash.
March 11-12, 1926

Executive Committee, Pacific Coast Electrical Association—

Meeting in office of William Baurhyte, President.
Los Angeles Gas & Electric Corporation Building, Los Angeles.
March 11, 1926.

Electrical Men of Colorado—

State-wide meeting under sponsorship of Electrical League of Colorado
Denver, March 26, 1926

Technical Conclave, P.C.E.A.—

San Joaquin Power Building, Fresno, Calif.,
April 7-9, 1926.

Transportation Section, P.C.E.A.—

San Francisco, April 23-24, 1926.

Advertising Section, P.C.E.A.—

San Francisco, Calif.,
April 30, 1926.

Electrical Supply Jobbers' Association—

Annual Convention—Hot Springs, Va.
May 31-June 4, 1926

Pacific Coast Electrical Association—

Annual Convention—Biltmore Hotel, Los Angeles
June 8-11, 1926

Associated Manufacturers of Electrical Supplies—

Annual Convention—Hot Springs, Va.
June 7-12, 1926

National Electric Light Association—

Annual Convention—Atlantic City, N. J.
May 17-21, 1926.

Confer on Construction of Lines to Rural Communities

Members of the National Electric Light Association committee on rural electrification held a conference in Salt Lake City Jan. 7. The session was held at the Hotel Utah, and technical matters relating to the construction of lines to rural communities in the United States were discussed.

G. C. Neff, vice-president of the Wisconsin Power & Light Company, Madison, Wis., chairman of the committee, presided. Other members in

attendance were Dr. E. A. White of Chicago, director of the Committee on the Relation of Electricity to Agriculture; F. F. McCammon of Denver, Colo.; Eugene Holcomb of Jackson, Mich.; J. B. Johnson of Elyria, Ohio; Arthur Huntington of Cedar Rapids, Iowa, and George T. Bragg, of Portland, Ore.

Jobbers Name New Officers at Del Monte Meeting

C. B. Hawley, of Salt Lake City, was elected chairman for the ensuing year by the Pacific Coast Electrical Supply Jobbers' Association at its regular quarterly meeting held at Del Monte, Jan. 28-30. O. B. Stubbs was named an executive committeeman and Albert H. Elliot was re-elected secretary of the organization in the election of officers.

At the open meeting an illustrated lecture on the "Lure of the Northwest" was given by Frank Branch Riley, of Portland, Ore., through the courtesy of Floyd Averill, of Fobes Supply Company, Portland.

Ray W. Murphy, of the Westinghouse Lamp Company, San Francisco, presided over the golf dinner given Saturday evening in his customarily gracious manner.

Book Reviews

ELECTRICAL ENGINEERING PROBLEMS

By JOHN G. PERTSCH, Jr., Professor of Electrical Engineering, Cornell University. Part 1, Direct-Current Circuits and Apparatus. First edition. 208 pages. 100 illustrations, 824 problems. McGraw-Hill Book Company, Inc., New York. \$2.

This work is precisely what the title indicates, a set of problems. The book has been developed from a set of problems used by the author for some years in courses given to junior students in electrical and mechanical engineering at Cornell University. They are designed to give the student a set of exercises in which he may find practical application for the fundamental principles of electrical engineering.

Problems on electrical and magnetic circuits and their application to direct-current machinery are treated in this book. Alternating-current problems are left for a companion volume. The author has divided the 824 problems given in this volume into thirty grouping according to subject and ranging from the simplest power and energy problems to those dealing with electrical illumination. Problems are arranged progressively according to the author's idea of the importance of the subject, and the number of problems under each subject depends upon the importance of the subject.

The book should serve well as a supplement to a text or lecture course in direct currents. Its use as a source of problems for self-instruction would be limited, however, by the fact that no answers to problems are given, thus making it somewhat difficult for the individual student to check his own work.—G. R. H.

Personals

F. L. Brewer, since 1921 with the Mountain States Power Company, Albany, Ore., has been made sales manager of the merchandise department of that company, succeeding F. E. McKenna, who resigned to go into private business. Mr. Brewer was born at Marshall, Mich., where he completed his high school education. Entering



F. L. BREWER

the University of Michigan in 1917, he was graduated in 1921 in a general course. In September of that year he entered the employ of the Mountain States Power Company, Albany, as stockkeeper, and in the next four years was advanced through several positions, including cashier and salesman, until August, 1925, he was promoted to his present position. Later in the year, when the general offices of the company were moved to Tacoma, Wash., there was practically no change made in the personnel at Albany, and Mr. Brewer's headquarters remain in that city.

W. F. Raber, vice-president and general manager, San Diego Consolidated Gas & Electric Company, was a recent visitor to Los Angeles.

Charles Franke, vice-president of the Holophane Glass Company, New York, has been making an extensive visit to the Pacific Coast. He recently spent some time in San Francisco.

Thomas W. Carlson, Northwest sales representative for the Benjamin Electric Company, Seattle, Wash., attended the sales meetings of The Washington Electric Supply Company, Spokane, Jan. 12 and 13.

Clark Baker, of the National Mazda Lamp Works of the General Electric Company, Oakland, Calif., recently made a business trip to Chicago. While there he attended the conclave meeting of the Commercial Section of the N.E.L.A. as a representative of the lighting committee of the Pacific Coast.

H. H. Jones, vice-president and general manager of the Western States Gas & Electric Company, Stockton, Calif., made a brief stay in San Diego during January. Mr. Jones was formerly general manager of the San Diego Consolidated Gas & Electric Company.

William K. Vanderpoel, since 1916 general superintendent of distribution of what is now the electric department of the Public Service Electric & Gas Company, Newark, N. J., has resigned to become vice-president and executive engineer of the Okonite Company and the Okonite-Callender Company, Inc., manufacturers of wire and cable for electric purposes, with factories at Paterson and Passaic and general offices in New York City. Mr. Vanderpoel ranks high among the electric distribution engineers of the country.

R. E. Thatcher, superintendent of service, central district, Puget Sound Power & Light Company, Seattle; Ellis Van Atta, radio expert, Pacific Power & Light Company, Walla Walla, Wash.; E. G. S. Pryor, resident engineer, Underwriters' Laboratories, Inc., Seattle; J. B. Downer, city water department, Seattle; C. H. Lum, assistant general manager, National Board of Fire Underwriters of the Pacific; and Roy C. Kenney, of the Portland branch of NePage, McKenney & Company, Seattle, were among the prominent members of the industry in attendance at the first annual convention of the newly organized Northwest Association of Electrical Inspectors held in Portland, Jan. 11 and 12.

F. G. Marshall, of the Pacific Gas and Electric Company, San Francisco, lately attended the conclave meeting of the N.E.L.A. Commercial Section, representing H. M. Crawford, chairman of the Commercial Section, P.C.E.A.

James M. Evans, engineer, Board of Fire Underwriters of the Pacific, Los Angeles, was a recent business visitor to Santa Barbara.

M. J. Bendekovic, an assistant bookkeeper in the offices of the Public Service Company of Colorado, Denver, has won the Colorado National Guard's appointment to West Point. He is the third employee of the company in three years to win this honor.

A. E. Griswold, of the A. G. Manufacturing Company, Seattle, has been making an extended visit in California. He was recently in Los Angeles, accompanied by George Gray, his California distributor.

H. C. Hill, motor expert for the General Electric Company, recently addressed a large gathering of electrical engineers, contractors and dealers of San Diego, the guests of the San Diego chapter of the American Association of Engineers.

Ernest P. Kipp, Western district sales manager of the Hazard Manufacturing Company and vice-chairman of the Electric League of Colorado, Denver, attended a factory meeting at Wilkesbarre, Pa., a short time ago.

F. W. Carlson, representative of the Crouse-Hinds Company in Seattle, recently returned from a trip East, where he attended the meeting of the Association of Railway Electrical Engineers at Chicago. He also visited Syracuse where he spent some time going over new engineering developments, and paid a brief visit in San Francisco.

Lars Jorgenson, San Francisco engineer, who is the patentee of the constant-angle arch dam construction used in the concrete dam of the city of Tacoma's Cushman project, recently made an inspection of the dam. Mr. Jorgenson has been acting as consulting engineer during its erection.

W. C. Bryant, president of the Bryant Electric Company, Bridgeport, Conn., who has been making a tour of inspection of the company's Pacific Coast offices, attended the recent meeting of the Pacific Coast Electrical Supply Jobbers' Association at Del Monte, Calif., in company with H. B. Sanderson, district manager.

James S. Posgate, manager McLaughlin Glass Company, Los Angeles, was a recent San Francisco visitor.

W. A. Schoel, sales manager of the southern district of the Puget Sound Power and Light Company, Chehalis, Wash., was a recent speaker before the Chehalis Rotary Club. He briefly reviewed the development of power and light by electricity in this country since it was discovered to be economically possible some forty-five years ago.

H. W. Eales, chief electrical engineer, Union Electric Light & Power Company, and W. H. Sawyer, president East St. Louis & Suburban Railway Company, both of St. Louis, sailed from San Francisco Feb. 2 for Australia. They have been appointed by the government of the State of Victoria ostensibly to "investigate and report on the Yallourn brown coal electricity-generation scheme and connected power undertakings of the Government Electricity Commission" but actually to give Australia the benefit of American experience in the development of power resources.

E. D. Stewart, branch manager of the Westinghouse Electric & Manufacturing Company at El Paso, Texas, was a recent visitor at the Los Angeles office of the company.

John F. Greenawalt, manager publicity department, the Mountain States Telephone & Telegraph Company, and district governor of the Kiwanis Club; M. H. Soule, manager, Western Public Service Company, Laramie, Wyo., and past president of the Laramie Kiwanis Club, were among the utility men who took an active interest in the recent district convention of the Kiwanis Club in Denver.

J. G. Jeffrey, director of publicity, Los Angeles Railway, accompanied by Mr. Thomas, secretary of the Los Angeles Advertising Club, visited San Francisco a short while ago in the course of a tour of all of the advertising clubs in California.

Claude W. Mitchell has been appointed chief electrical engineer of the Board of Fire Underwriters of the Pacific, as head of the electrical department which has been organized as a separate department. Mr. Mitchell has been associated with the Board as an electrical engineer for a number of years. He also is secretary of the California Association of Electrical Inspectors.

Fred E. Hazard, director of advertising and sales promotion for the Serval Corporation, on a recent visit to Denver announced the appointment of Harold R. Smethills as representative of the company in the Rocky Mountain district and the transfer of William B. Milliken to Salt Lake City as representative of the Intermountain district.

D. D. Sturgeon, A. E. Bacon, Clarence Keeler, B. J. Rowan and Charles S. Newell were the electrical men who served as judges in the recent Christmas lighting contest sponsored by the Electrical League of Colorado.

Thomas Alva Edison, famous electrical inventor, is 79 years old, having just had a birthday. He was born in Milan, Ohio, Feb. 11, 1847.

W. W. Briggs, vice-president and general manager, Grays Harbor Railway & Light Company, Aberdeen, Wash., spent some time in San Francisco a short while ago. Mr. Briggs formerly was district manager for the Westinghouse company and later general manager for the Great Western Power Company in that city.

Scott Z. Henderson, attorney of Tacoma, Wash., has resigned as director and special counsel for Stone & Webster, Inc., and joined the Tennent Steel Casting Company of Seattle, Tacoma and Vancouver, Wash., as vice-president, according to announcement by M. G. Tennent, president of the concern.

W. P. Weathers, chief electrical inspector, Longview, Wash.; H. A. Patton, electrical engineer, Washington Surveying and Rating Bureau, Seattle; J. B. Fisk, consulting engineer, The Washington Water Power Company, Spokane; H. S. Jenkins, chief electrical inspector, Bellingham; Claude W. Mitchell, chief electrical engineer, Board of Fire Underwriters of the Pacific; and R. J. Larrabee, engineer, Underwriters' Laboratories, Inc., San Francisco, were among those who took an active part in the organization of the Northwest Association of Electrical Inspectors at the convention in Portland Jan. 11-12.

S. L. Nicholson, formerly assistant to the vice-president, Westinghouse Electric & Manufacturing Company, East Pittsburgh, has been elected acting vice-president.

G. R. Scott, formerly district manager of sales in Chicago for the Jeffrey-Dewitt Insulator Company, has become connected with the Electric Service Supplies Company, Chicago. That company also recently added to its staff C. V. Root, who is to cover the Chicago territory in the interests of floodlighting.

L. M. Cargo, Rocky Mountain district manager of the Westinghouse Electric & Manufacturing Company, and a member of the advisory board of the Electrical League of Colorado, lately visited various California cities.

Clare N. Stannard, vice-president and general manager, the Public Service Company of Colorado, Denver, entertained the women employees of the Denver office at a luncheon Jan. 9. Plans of the women's organization were discussed with company officials and Miss Inez Thompson, a company employee who is chairman of the Women's Information Committee of the Rocky Mountain Division, N.E.L.A.

C. H. Gleason, of the accounting division of the Public Service Company of Colorado in Denver, has been transferred to the Kansas City Gas Company to take charge of the securities accounting department of the company in that district. Associates in Denver entertained at a farewell dinner in his honor at the Lakewood Country Club Jan. 8.

Leroy H. Crandall, formerly with the California Electrical Bureau, San Francisco, has been appointed northern California representative for Universal ranges by C. J. E. Watson, district manager of the Landers, Frary & Clark organization. The appointment became effective Feb. 1.

Emmett Ward, sales manager of the San Francisco district, Great Western Power Company of California, will succeed H. E. Brillhart as manager of the company's northwestern division, with headquarters at Napa. It was previously announced that J. W. Anderson, district sales manager for the company at Sacramento, would take Mr. Brillhart's place but, owing to illness, the above change has been made necessary. Mr. Anderson will continue in his position at Sacramento.

W. C. Sterne, retiring chairman of the Rocky Mountain Committee on Public Utility Information, Denver, was the guest of honor at a dinner at the Denver Club Jan. 23 arranged and attended by leading electrical and utility men of the Rocky Mountain region.

George A. Gray, of George A. Gray Company, manufacturers' agents of San Francisco, recently spent a week in southern California.

Herbert Cram, formerly with the Universal Electric Company, has joined the staff of the Edison Electric Appliance Company and probably will make his headquarters in Oakland.

W. G. Campbell, manager conduit department, Central Tube Company, Pittsburgh, recently made a tour of the Pacific Coast territory in the company of H. F. Boardman of Los Angeles, Pacific Coast representative of the company.

W. E. Creed, president, Pacific Gas and Electric Company, San Francisco, was one of the speakers at the second annual conference of the Allied Steel Industries held at Del Monte, Calif., late in January.

J. H. Lynch has been made manager of the New England merchandising division of the Westinghouse Electric & Manufacturing Company with headquarters in Boston. John Andrews, Jr., formerly manager of the Cleveland branch office of the same company, has been named manager of the Detroit district office.

J. H. Mahler, formerly of the air brake engineering department of the General Electric Company, Erie, Pa., has joined the Electric Service Supplies Company, Philadelphia, as bus specialist.

Edward W. Weiler, for six years development engineer with the General Electric Company, recently has associated himself with the Eureka Tool and Machine Company, Newark, N. J., in charge of the mechanical and electrical specialty department.

Phil Gough of Listenwaller & Gough, Los Angeles, spent some time in San Francisco on business recently.

Frank N. Smith, formerly connected with the California Electrical Bureau, Los Angeles, has joined the exploitation department of Pathe Brothers.

H. E. Dralle, from the general engineering department of the East Pittsburgh plant of the Westinghouse Electric & Manufacturing Company, and Thomas Fleming, vice-president of the Oil Well Supply Company of Pittsburgh, were in Los Angeles for the American Petroleum convention, Jan. 19-22. L. M. Cargo, district manager for the Westinghouse Electric & Manufacturing Company in Denver, also attended the convention.

B. Y. Gibson, of San Francisco, Pacific Coast representative of the Walker & Pratt Manufacturing Company, Boston, recently was in Los Angeles in the interests of his firm.

George R. Randall, president and general manager of the Salt Lake Electric Supply Company, who was elected president of the Rocky Mountain Electrical Co-operative League, at Salt Lake City, for the year 1926, has been identified prominently with the electrical industry in that city for a number of years. He was born at Twin Creeks, Wyo., in 1887, and was educated in the grade schools and the University of Utah, Salt Lake City. He began his electrical career as a helper at the Murray, Utah, plant of the American Smelting & Refining Company in the spring of 1902. One year later he became employed as a helper



GEORGE R. RANDALL

with the Salt Lake Electric Supply Company, the institution which he now heads. During the next seven years he worked with several contracting concerns in Salt Lake City; and returned to the Salt Lake Electric Supply Company as a salesman in 1910. In February, 1914, he was made superintendent of construction. In March, 1916, the Salt Lake Electric Supply Company discontinued its retail merchandising and fixture business and confined its activities to construction work, and at that time Mr. Randall was appointed manager. In November, 1919, the business of this concern was purchased from the Capital Electric Company by Mr. Randall and Joseph L. Lawrence. Mr. Randall takes an active interest in anything that tends to promote the best interests of the electrical industry in the Intermountain section.

Obituary

J. G. Pomeroy, distributor for the Rome Wire Company in Los Angeles, died in that city Jan. 23. He had been a resident of Los Angeles since 1912, going there from Chicago where, for many years, he was sales manager for the Adams Bagnall Company. He was exceedingly active in the Electric Club of Los Angeles and was one of its first sergeants-at-arms.

George D. Squires, member of the California Railroad Commission, died in San Francisco Jan. 31. He was 71 years old.

TRADE NOTES

The Kurz-Kasch Company, Dayton, Ohio, has placed on the market a group control for radio sets providing a master control and at the same time a correcting vernier for each of the tuning units. The equipment is adapted for use in rebuilding old sets or for building new sets with the master-control feature. The equipment is being placed on the market in kits, including all necessary parts for changing over an ordinary three-dial radio frequency set to a master-control tuning. The advantages claimed for the new control apparatus include simultaneous control by the master dial, vernier tuning for each of the units, and easy location of stations by use of master control and connection of verniers.

Celite Products Company has moved its San Francisco offices to 140 Spear Street, that city.

The Diamond Power Specialty Corporation, Detroit, has appointed M. J. Miller as sales engineer in charge of the Detroit district.

The Selector Company, 2005 Sixth Avenue, Seattle, is the name of a new manufacturer in that city making a loud speaker. Stephen J. Linden is president, and J. H. McLennan, formerly Pacific Coast representative of Electrical Record, is general sales manager.

Peerless Insulated Wire & Cable Company, New York, has issued recently an elaborate descriptive bulletin containing sixteen full-page illustrations and a brief outline of the process of manufacturing cotton-clad weatherproof wire and cable.

Harry Ford Electric Store, 6808 Putnam Avenue, Culver City, Calif., is a new addition to the business district there. Mr. Ford formerly was associated with Fred Jarvis Electric Company of that city and is well known in the community. He will do electrical contracting as well as radio and electrical merchandising.

The Globe Electric Company, formerly located in the Bay Builders Exchange Building, Santa Monica, Calif., and operated by D. E. Baird, has moved into the Wilshire Electric Store at 1030 Wilshire Boulevard, Santa Monica. The latter stock has been purchased by Mr. Baird, who is conducting business under his old firm name of Globe Electric Company.

The Robbins & Myers Company, Springfield, Ohio, has issued two large fan catalogs under Nos. 1265 and 1271. The former gives a complete description with illustrations of its line of electric fans for a.c. and d.c. circuits, non-oscillating, oscillating, ceiling and ventilating fans. Complete price lists also are included in the catalog. The other catalog embodies dealer helps and selling opportunities and contains samples of the various kinds of literature on fans published by the company.

J. H. Bunnell & Company, New York City, manufacturers of high-grade telegraph apparatus, fire-alarm apparatus and other electrical equipment, has been acquired by J. J. Rafferty and J. G. Dougherty. Mr. Rafferty has been elected president of the company, while Mr. Dougherty will become vice-president and treasurer.

The Sunset Electric Company, Seattle, plans immediate construction of a new factory on Eleventh Avenue and Pine Street to cost \$60,000. The structure will be one-story and basement, ordinary masonry construction, 120 x 120 ft. in size. The firm now is located at 1509 Broadway.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued a publication describing its type CL carbon circuit breakers, which are claimed to be of particular interest to builders and architects. This type of breaker, designed especially for 250-volt industrial application where a compact breaker is required, is described fully in this circular under No. 1705-A. The pamphlet is well illustrated and outlines the important characteristics of the breaker, including effective shock absorption, adjustment and equalization of brush pressure and use of overload attachments.

Groundulet Company, Newark, N. J., has moved into its new quarters at 480 Broad Street, that city.

General Electric Company, Schenectady, N. Y., has introduced two new types of portable curve drawing instruments, the CP-4 and the CP-5. These instruments are intended for alternating current work, the first being equipped with a Chelsea clock paper drive and the second with a Warren motor. With them chart speeds of one, three, six or twelve inches per hour may be obtained, and all instruments are equipped with a gear shift which changes from inches per hour to inches per minute, or vice versa, on either clock or motor-driven charts.

P. E. Chapman Electrical Works, St. Louis, Mo., have placed on the market an electromagnetic seed cake stripper head which they claim eliminates damage to press cloth and at the same time provides safety for the operator. The machine is described and illustrated in the folder recently issued by the company.



Deep problems of physics confront these gentlemen. They are none other than the Technical Section, P.C.E.A., at their recent conclave in San Francisco. Table 1 from the left is making a study of which fork to use on the salad. Table 2 is deeply concerned over the inductive interference encountered when trying to eat peas with a knife. Table 3 is more interested in safety practices and is watching to see what the head table does with its elbows in crowded quarters. Table 4 considers the question of writing a paper on "Metered Meat, or What Price Gory." And the last table, being prime movers, are moved to prime or primed to move, it will never be known which.

Journal of Electricity

Devoted to the Economic Production and Commercial Application of Electricity
IN THE ELEVEN WESTERN STATES



ELECTRIC

HOME

Off to a Flying Start

NEVER before in the history of the electrical industry in California has any plan been received with the enthusiasm which has greeted the RED SEAL PLAN. Electrical contractors are finding no difficulty at all in selling the idea to builders. The Plan is less than two months old in this state and there are already over thirty Red Seal Homes. There is a part for everyone in the electrical industry in putting this Plan across. DO YOUR SHARE!



CALIFORNIA ELECTRICAL BUREAU

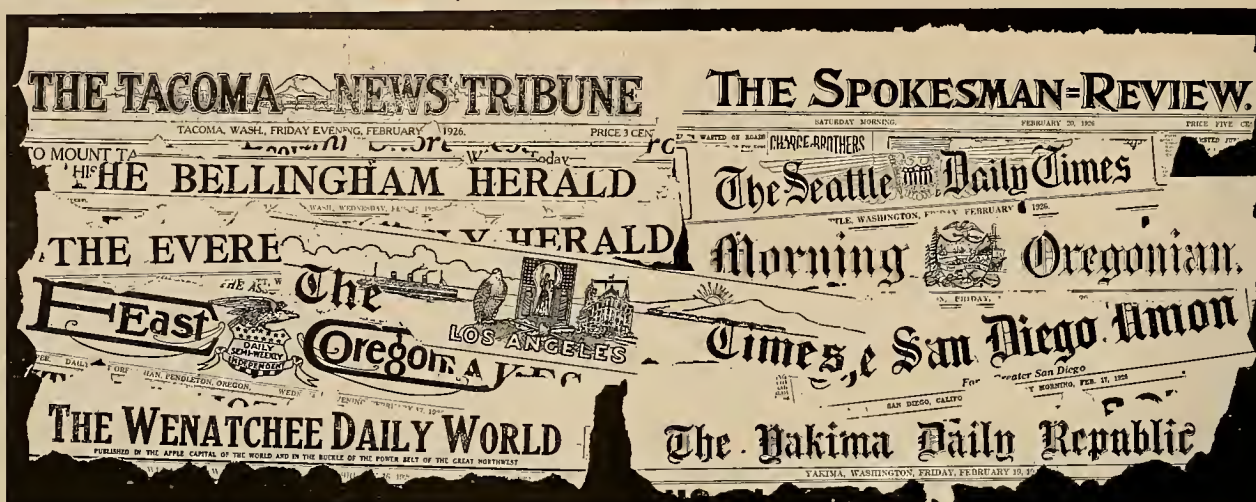
Offices at

San Francisco

Fresno

Los Angeles





These are only a few of the newspapers carrying Electro-Kold advertising

Now—an advertising campaign with a half million circulation!

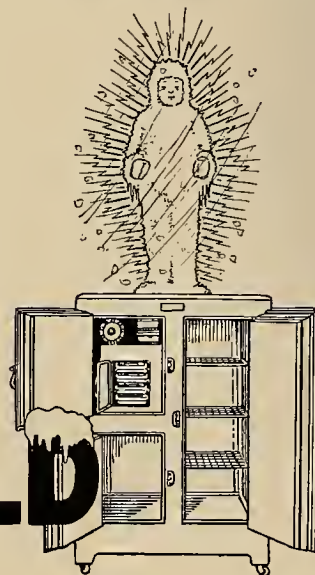
THROUGHOUT the western states a selected list of newspapers are to carry the advertising campaign for Electro-Kold in 1926. Already the opening guns have been fired and the campaign actually begun. Right now its circulation is over half a million. As distribution is widened the advertising will be strengthened. And every advertisement will carry the name of the Electro-Kold dealer in that territory. The newspaper advertising, however, is only one part of our plan of co-operation. We have an extremely liberal dealer proposition. Write for information.

More than 100 fewer parts than any other electric refrigerator we know of. Dependability proven by over 4 years of use.

The Electro-Kold Corporation
Spokane, Washington

ELECTRO-KOLD

The Simplest Electric Refrigerator



Journal of Electricity

With which is consolidated the "Electrical Journal" and the "Journal of Electricity, Power & Gas."

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Significant Gatherings

PRACTICALLY all well planned and arranged gatherings for the discussion of questions of importance to a particular group bring forth in concentrated form the wisdom of the best minds engaged in a study of those problems. It becomes the province of a sincere technical journal to interpret and summarize the thought of such gatherings that the many who are unable to attend in person may find the magazine their true representative.

Aside from reporting the significant activities in the field covered by it, of which the report on the progress of the experimental arch dam, published in this issue, is a typical and valuable example, the Journal of Electricity endeavors to have its trained representatives bring to its columns the best thought expressed in significant public gatherings in which subjects of import to the electrical West are discussed.

This issue contains two noteworthy examples of this practice. A most complete report of a truly extraordinary gathering, the first general meeting of the Commercial Section of the Northwest Electric Light and Power Association in Spokane, Feb. 18-19, brings to the industry the attitude and research of the Northwest upon sales efforts in electric ranges, domestic refrigeration, commercial lighting, rural electrification and residential rates. Each of these topics is one in which the industry as a whole is deeply concerned.

Of more general interest than any other single phase of development in the entire West today is the Colorado River problem. At the Commonwealth Club of California, Feb. 18, leaders of the respective contesting factions gave their views. A digest of those variant aspects of the situation may be found in these pages, also.

HIGH HEADS AND LOW



STONE & WEBSTER
INCORPORATED

DESIGN • BUILD
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FINANCE



EDITORIAL

What Place the Electrical Engineer?

IN this day of short cuts to everything there is a tendency to shunt past the electrical engineer in the design of large buildings, a tendency which should be regarded with real concern. In the passing by of this important member of the electrical fraternity there can result only a condition of more or less slipshod work for which somebody is going to have to pay in the long run.

It is quite possible that the electrical engineer may be considered only an added burden to a construction project. Many unthinking contractors and architects have been known to hold this attitude. With the dissemination of a smattering of electrical engineering practice in the training of salesmen, this negligence to call upon the trained expert conceivably may grow more common.

Will it not be well to consider for a moment, therefore, just how important the electrical engineer is to a job?

To begin at a vital point, it is more than likely that the electrical engineer will put enough copper into the job to carry the load demanded of it. Moreover, it is likely, too, that he will put in enough copper to carry sufficient overload so that the demands of natural progress will find capacity to meet at least a large percentage of those demands. This is all in the eventual interest of the client, whether he has sense enough at first to see it or not.

The electrical engineer will save the electrical contractor money because of the definiteness of his specifications and the ease with which the contractor's men can put in the job afterward from well drawn plans.

The central station benefits from the fact that the job can carry an overload if it can sell the tenant the apparatus with which to use electricity. It also benefits from the fact that the customer is better satisfied with his installation and gives the central station the credit for it.

The owner of the property is the one who benefits more permanently. If the architect, wishing to save on his expenses so that he may make his fee larger, neglects to call upon an electrical engineer for the electrical layout of a large job, he sometimes finds later that he must put on such an engineer to inspect the job while it is being done, to guarantee to him and his client that the electrical contractor does all that is expected of him. Such a service nearly always costs that architect more than if he had called in the engineer in the first place. The electrical contractor is

often forced to lose money on closely figured estimates from indefinite specifications, and worst of all, the owner of the building gets a job which hurts it from an investment standpoint.

It is reported on good authority that certain buildings built under such a plan are the most expensive buildings in a certain large city to maintain and to keep rented. Because the electrical equipment in them is inadequate, tenants are harder to find and rents are consequently lower. On the other hand, buildings on adjacent lots, because of completeness of electrical installation and capacity, are in demand for office quarters at all times.

Certainly the electrical engineer should be eliminated no more than the architect himself, than the contractor, the individual workers necessary to construct a building. And certainly every branch of the industry suffers when he is eliminated. His presence is paid for in some way whether he is employed or not. In most instances it is far better that he should receive his pittance for doing a good job than that he should be paid for in regrets.

Electricity in Merrie England

ENGINEERS returning from voyages abroad are generally unanimous in their estimates of the situation as regards electric supply in Great Britain, placing it variously as being from ten to twenty years behind the development in this country in many respects. These are not merely self-satisfied and superior personal opinions of the situation, such as this younger country is often accused of holding up the "old country" in a spirit of ridicule. Goodness knows America is held in semi-contempt with respect to its cultural requisites by Europeans, if one is to take the prevailing lecturing European gentleman seriously. This estimate of the electric situation is no mere matter of opinion or viewpoint. It is a cold-blooded engineering estimate of a very obviously contrasting situation.

England's electricity supply, as it is termed there, is dependent upon a great multitude of small isolated plants, operating at varying frequencies, voltages and efficiencies. This is a condition which found its counterpart in America from ten to twenty years ago. Each community, whether it be a community within the boundaries of a large city, or itself a town, if it has electricity, has its own little plant, distribution system, and individual frequency and voltage. Very few systems are linked together to provide what we now consider an ob-

vious necessity, continuity of service in case of breakdown of one of the small plants.

But there is a government movement under way in England to centralize generating plants to a few large efficient plants, interconnecting these plants by means of a network of transmission lines similar to those found economical and successful in the United States. The scheme naturally implies a standardization of voltages and frequencies and other operating requirements. The plan thus far proposed calls for an "Electricity Board," which shall buy wholesale the product of the large individual plants and operate a common bus-bar transmission system from which the individual communities may buy power.

Whether the proposed plan in respect to the government "Electricity Board" is workable and desirable is not for an outsider to say. We in this country do not know political conditions in England well enough to comment intelligently upon the subject.

What is interesting in the light of this scheme is that interconnection, centralization of generating plants, and standardization of operation are held in question in favor of still further extension of the isolated-plant idea. That question, in the light of experience in similar physical environments in the United States, is no longer a question. It is relegated to the past together with the three-toed horse.

A correspondent of the "Electrical Review," foremost of English trade publications dealing with electrical subjects, raises that question, nevertheless. And he strives to prove his point by showing that in a particular case a certain town found that it would be cheaper to install its own internal-combustion-engine plant than to buy electricity from a neighboring town from which a transmission line of 18 miles would be required.

The facts as presented are no doubt unimpeachable, but the point of the matter is that the correspondent takes a characteristically short-sighted view of the problem. He has not realized the economies available in a possible commercial expansion resulting from the existence of these power-transmission lines. True enough, one little town buying power at a distance of 18 miles from a station would offer little in the way of advantage, but considering that there are five or six more towns in the same 18-mile radius and many times that number in a 40 or 50-mile radius in which two or three large plants might serve a loop system of transmission lines economies appear to be possible.

Besides, with small plants operating at varying frequencies, there is no encouragement to uses of energy for other than lighting load, whereas with standardized frequencies, manufacturers might well dispose of many times as many current-consuming devices which would build up the central-station load to reduce operating cost still further. It is being done every day in America, and is not even open to question here.

Far be it from the American cousin to give his British relative advice. Yet it would seem foolish

of a nation noted for its men of intellect and culture to hold itself in check for many years for want of vision and ordinary appreciation of some of the engineering facts which have been tested and proved in this crucible of enterprise, America.

Construction Starts on Experimental Arch Dam

ANNOUNCEMENT that actual construction has commenced on the experimental arch dam on Stevenson Creek, California, is of more than passing interest to engineers. As has been previously stated in these columns, the proposed studies by Engineering Foundation's committee on arch-dam investigation are expected to reveal much information which will be of value and interest to hydraulic engineers. Engineers expect that data will be developed which will have a direct bearing upon future dams of this character and will be reflected in much lower costs.

Heretofore there have been little or no design data for such structures. Because of this lack of information there has been a tendency to use more materials and to make dams more massive to insure a proper factor of safety. For this reason costs have been greatly increased. Arch dams have been used for centuries, and, although there has not been a single recorded failure of a concrete or masonry arch dam, their design is a matter of conjecture. The investigation will change this.

Aside from its bearing on future hydroelectric developments, the investigation will be of interest to the electrical industry because measurements of deformation, deflection and temperature are to be made by electrical methods. Special apparatus has been developed for this purpose. Descriptions of some of this equipment will be found on another page of this issue.

The entire project is being financed by contributions from manufacturers, power companies and others interested in the investigation. While the support it has received has been generous there are those who have not contributed who might well do so. At any rate when the studies have been completed a new contribution will have been made to engineering.

Function of the Club Publication

THE R.P.M., published organ of the Seattle Electric Club, celebrating its third anniversary, describes its function in its February number in part as follows: "This publication has tried to chronicle these events, telling them in lighter vein, lest their importance be exaggerated. The real motive of the R.P.M., as its editors see it, is to spread good cheer, disseminate gossip in the friendliest spirit, make fun and by these ties draw the membership of the club into closer fellowship." It then continues further to elucidate its policy, answering possible criticism, and commending its readers to the trade journals for the more substantial and meaty material concerning the industry.

Truly the stated purpose of the R.P.M. is laud-

able. "Lest their importance be exaggerated"! How important it is that the importance of events be not exaggerated! Humor, delicate satire, harmless sarcasm, good-natured banter—potent stabilizing influences are these. Let there continue to be media through which they may operate to prevent all of us from an occasional tendency to "mountainize" molehills and to see great engulfing waves instead of ripples on the surface.

We have found the R.P.M. to be, as it describes itself, "a carefree wight." The lighter vein does indeed color the sprightly recital of news in its columns to the extent that we imagine it fulfills its stated purpose. Congratulations to you, R.P.M., on your birthday, and more revolutions to you, that you may carry on in the cause of fun and fellowship.

Are Men Better

Demonstrators Than Women?

THOSE who champion the "rights of women," the nineteenth amendment and all that sort of thing, would have been pained perhaps, if not aroused to caustic comment, to hear a speaker in a recent committee meeting claim that as demonstrators of electric appliances women were not to be classed with men. Naturally enough the contention brought forth opposing views, for the subject of woman's fitness for business careers always will bring forth warm controversy.

The basis upon which one speaker made his assertion was this: "A woman demonstrator, by showing that she knows more about an appliance than her prospect, antagonizes the prospect and does more harm than good. Women do not like to be shown that they do not know as much as another woman, and the demonstrator who is a master of electric cooking, for instance, makes the prospect feel jealous and really hurts the sale. On the other hand, a man, not pretending to know all about cooking, can demonstrate the appliance more from a selling angle."

Those who differed with him said: "Of course there are women demonstrators, and women demonstrators. And the right kind of woman demonstrator is tactful and doesn't try to impress her prospect with how good a cook she is, but how easy it is for an average woman like herself to master this electric servant. And women will get entré into a home where and in a way that no man can. A good woman-demonstrator goes into a woman's home, and while she is taking off her hat and coat comments on her hostess' tasteful draperies or furnishings, talks about things of the home as only a woman can talk of them to another woman, and establishes confidence for herself and the company she represents that no male salesman can quite attain. And the sale of the appliance is made more naturally and easily as a consequence."

And, ladies and gentlemen, there it stands. It is as much settled now as it ever will be. But the fact remains that many wise merchandisers will select

men and many will select women, and that both probably will bring in increased business, according to the merits of the individual cases. It resolves itself simply into a case of salesmanship, and after all, the sex of the salesperson has very little to do with it.

He Who Gets

Whacked

THE "Trolley Philosopher," as he terms himself, of Los Angeles Railway, sifts much wisdom in with his humor in that genial task of acquainting the riding public with the facts about transportation. In a recent issue of the little leaflet, *Azuride*, he speaks of the old political cry, "Whack the corporations," and points out in breezy words that such a cry is in reality one to "whack the voters."

"In years gone by," says the philosopher, "the professional politician would mount the platform, swallow a tablet to disguise his breath as the lily of the valley instead of the barrel of the alley, and claim that he was just 66 per cent nearer to purity than Ivory soap. Next he would promise that, if elected, the farmers would receive plenty of rain for their crops and the First M. E. church piano would keep in tune.

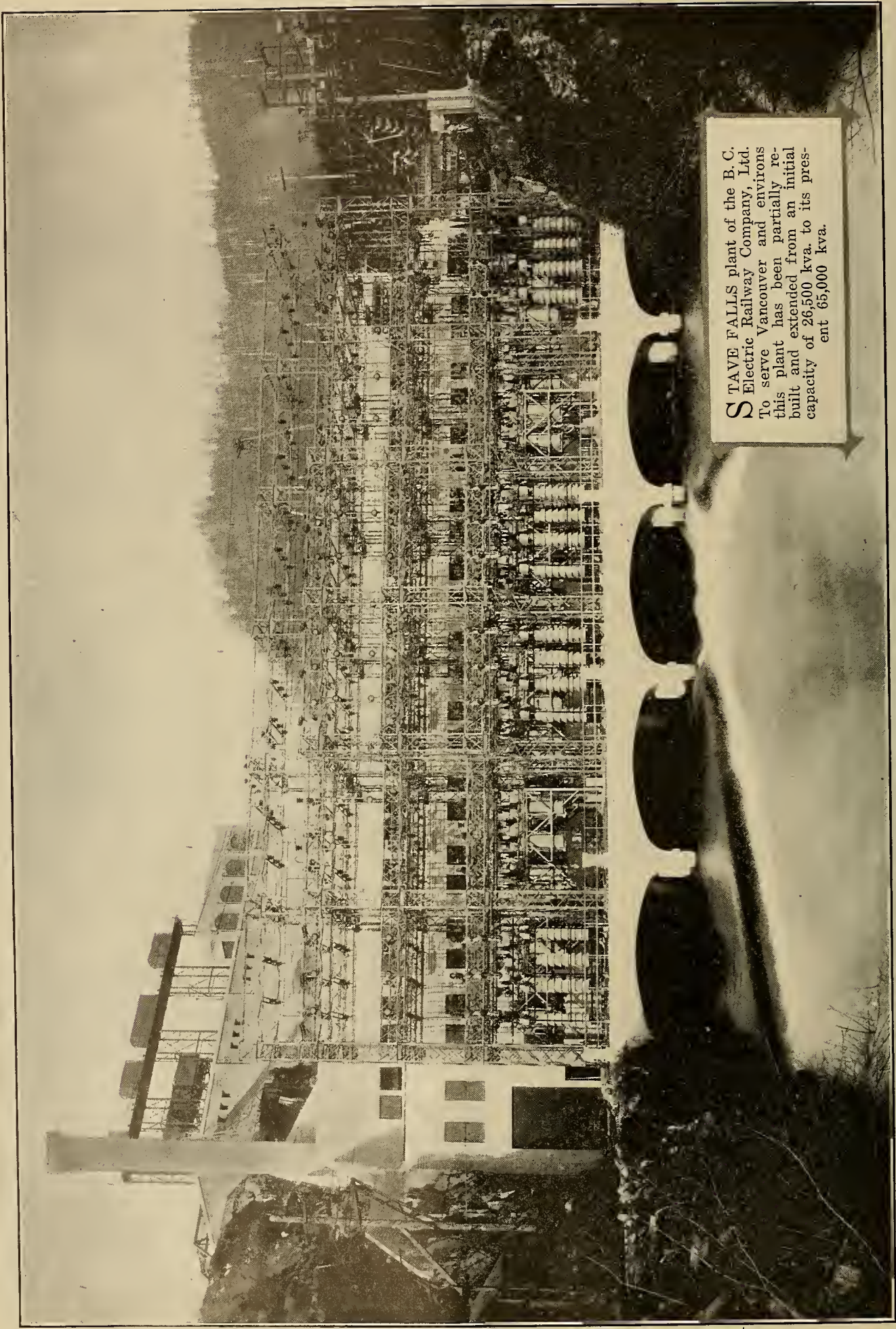
"The politician's code called for the 'whack the corporations' keynote at that point. Railroads and gas companies, etc., were promptly laid low with a blast of fiery oratory. It was great vote-getting thunder, but as the earthquake said, 'The world do move.'"

Continuing more seriously, he points out that utilities are the most important factors in city development and that for a people to whack the corporations is in effect to whack themselves. The creation of obstacles to hamper public-service corporations in giving service is nothing but an interference with the necessary conveniences of the public, a fact of which the public is becoming aware. "The old tactics have lost their spell because the public utilities are builders of cities."

Business First,

the Right Policy

IT is gratifying to note the conservative and business-like air that pervades the conclaves of the Technical Section of the Pacific Coast Electrical Association. Full attendance at all sessions and an active participation in committee discussions by those attending show sincere interest in technical matters of importance to their respective companies. Social activities fade into the background. Even luncheon and dinner meetings are devoted to the discussion of matters of actual constructive value. Through these discussions and interchanges of information come economies in design and operation that result in good showings on the balance sheets of the utilities participating. The continued interest and support of utility executives are well earned, and congratulations are due to those guiding the activities of the Technical Section.



STAVE FALLS plant of the B. C. Electric Railway Company, Ltd. To serve Vancouver and environs this plant has been partially rebuilt and extended from an initial capacity of 26,500 kva. to its present 65,000 kva.

The Stave Falls Development

By E. E. Carpenter

Consulting Engineer, British Columbia Electric Railway Company, Ltd.,
Vancouver, B. C.

IMPROVEMENTS and additions at the Stave Falls hydro plant of the British Columbia Electric Railway Company, Ltd., make available to that company's system another 21,000-kva. block of power. The betterment of Stave Falls was and is a step in the further development of the hydraulic power possibilities contemplated in the Alouette-Stave-Ruskin project of that company.

The work embraced by the last-mentioned project includes the development of storage and power at Alouette Lakes; the raising of existing dams and the erection of a new dam at Stave Falls; the rebuilding of the four original units at Stave Falls and the installation of a fifth unit, and the construction of the Ruskin dam and power house at a point about three and one-half miles down-stream from Stave Falls.

Of this work the Alouette dam and tunnel have been completed and the water thus impounded diverted through a tunnel into the upper end of Stave Lake. Initial construction work is under way on the Alouette power house, which will utilize the head between Stave and Alouette Lakes. All construction and rebuilding operations at Stave Falls are essentially complete. The Ruskin development is for the future.

General Features.

Initial development of the Stave Falls project was carried on by the Western Canada Power Company, which was acquired by the British Columbia Electric Railway Company in 1921. Original provisions were for a maximum water level of 318 ft., control equipment and penstocks for four 8,825-kva. generating units, three of which were installed in 1911. Improvements and additions undertaken in 1922 and now essentially completed include the installation of the fourth and fifth generating units, the raising of the intake dam, the building of the west wing dam and the Blind Slough dam, and the filling in and raising of the sluice dam. The new water level represents a net increase in operating head of 22 ft. over the original. A new penstock and additions to power house building, tail race and switching equipment of course also were necessary.

Stave Lake, as it stands today, is about 17 miles in length and 1½ miles in width. Its basin is

RECORDS of power usage in and around Vancouver, B. C., covering a period of some fifteen years show a consistent increment of load increase of from 8 to 10 per cent. This means that the load is doubling every seven to nine years and that generating capacity must be increased accordingly. The generating capacity of the system of the British Columbia Electric Railway Company, Ltd. as of 1925, including those plants under construction, totaled 123,325 kva. To double this figure by 1934 means an average annual expenditure of about \$3,000,000. The Stave Falls improvement described by Mr. Carpenter in the accompanying article is one of the steps of the 10-year program.

clearly of glacial origin, the receding glacier of morainal dams, the remnants of which combined with occasional spurs of bedrock formed the barrier that held the original lake in place. The continuing erosive action of the river cut deeply into these natural gravel dams and even into the bedrock itself, leaving behind a series of terraced gravel banks along the valley. The lake terminated at a point about seven miles above the present site of the Stave Falls plant, but once again spread over its original bed when the water level was raised at the latter point.

Water Supply.

The watershed is unmapped, but is estimated to cover an area of about 450 sq. miles. This lies on the westerly slope of the Coast Range Mountains. In the main, this area is heavily wooded, but in the upper portions the elevations run above the timber line. The principal peak within the watershed is Mt. Baldy, which rises to an elevation of more than 6,000 ft.

Water supply records of the eighteen-year period from 1906 to 1923 show the mean annual run-off to be 3,880 sec. ft. Rain gauges at Stave Falls show the average annual precipitation at that point to be 78.3 in. This figure, however, compared with the run-off figures shows conclusively that the precipitation in the upper portion of the watershed must be much heavier than at Stave Falls. As a matter of interest and comparison the following table of monthly average rainfall is given:

January	10.4 in.
February	6.64 in.
March	7.66 in.
April	5.27 in.
May	4.21 in.
June	3.69 in.
July	1.82 in.
August	2.87 in.
September	5.24 in.
October	8.22 in.
November	11.39 in.
December	10.89 in.

Stave Lake is capable of impounding 471,000

acre-ft. of water. With this amount available for low-water periods the dependable continuous flow for power purposes may be taken as 3,500 sec.-ft. This is augmented by the continuous supply of 700 sec.-ft. from Alouette Lake, so that the total available at Stave Falls is 4,200 sec.-ft. at a maximum head of 130 ft., a minimum head of 96 ft. and an average head of 115 ft.

Intake Dam.

The intake dam closes the westerly channel of the river and lies about 200 ft. upstream from the power house. In it are set the intake gates, screens and other control structures for the proper feeding of the four original penstocks. The original dam, as constructed in 1911, was about 55 ft. in maximum height, 160 ft. long and designed to accommodate a high lake level of 318 ft. elevation with a freeboard of 7 ft. Provision was made for raising. Four radial Tainter gates, 19 ft. wide by 20 ft. high, controlled the flow to the penstocks. Timber stoplogs were set in bays upstream for emergency control.

About 8,800 cu. yd. of concrete were used in raising this dam to a crest elevation of 345 ft., 5 ft. above the new lake level. The Tainter gates were removed and the large wells needed for their proper setting were filled with concrete to give the necessary weight to the new structure. They

were replaced by four structural steel gates of the fixed-roller type, measuring 20 ft. wide by 21 ft. high, clear opening. The four hoisting winches for the gates are mounted upon a steel structure ex-



Fig. 1.—View at the head of Stave Lake; typical of Alouette-Stave higher watershed.

tending over the entire length of the four gate openings. These winches are operated through separate clutches by a cross-shaft driven by a 15-hp., 125-volt, d. c. motor set at about the mid-point of the shaft.

Steel stoplogs replace the old wood logs. They are constructed of two I-beams connected with

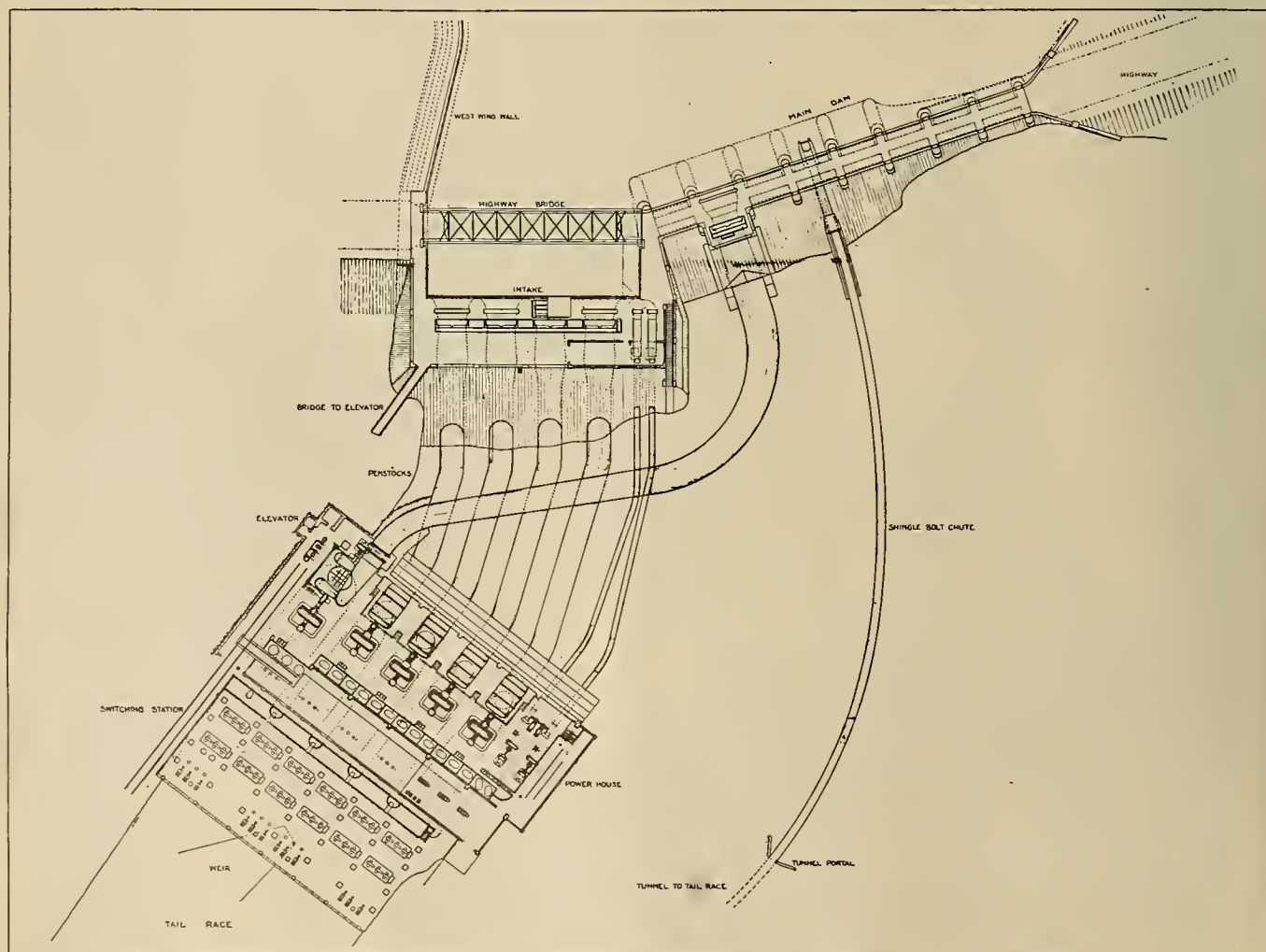


Fig. 2.—Plan view showing relative positions of penstocks, intake dam, main dam and power house.

riveted channels and plates and filled with concrete to give the necessary weight to permit placing. The stoplogs are handled and placed by a traveling hoist operating on a 9-ft. gage track extending the length of the gate openings. The arrangement permits the rapid and safe closure of any of the openings with the one set of stoplogs. The engaging and lifting of the logs is accomplished by means of a master log provided with catches at each end.

West Wing Dam.

At the west end of the intake dam the bedrock dips sharply westward and plunges beneath the overlying strata of glacial clays, gravels and boulders. Explorations indicated that foundations for cut-off walls on bedrock could not be reached. To remove the danger of seepage in this zone a heavy retaining wall was installed. This wall is about 280 ft. in length, connecting with the west end of the intake dam and extending upstream some 150 ft. where it curves inshore. The wall contains about 3,900 cu. yd. of concrete, is 50 ft. in maximum height, rests upon bedrock for a distance of about 160 ft. from the intake dam and upon clay and hardpan the rest of its length. About 20,000 cu. yd. of backfill were required for this wall. Part of this was sluiced in and part placed by dump cars. All was water-settled.

Main Dam.

The new main dam was the sluice dam of the original installation and as such was designed to discharge the entire flood of the river. The old dam was filled in and raised to the proportions of a solid gravity section concrete structure with crest elevation also at 345. Of the five original bays four were filled in solidly and the fifth used as the aperture for the penstock for the fifth unit. Approximately 9,500 cu. yd. of concrete were used in this dam.

The intake for the fifth unit is located in the second bay from the east abutment of the intake dam. A fixed-roller gate is provided with an operating mechanism similar to that used for the others. The old stoplog checks were utilized for the protecting screens.

One of the most ingenious features of this dam is the shingle-bolt chute. This chute provides for the uninterrupted passage of shingle bolts through the dam and into the tailrace below the power

house at all stages of water level. The large quantities of bolts produced along the lake made this feature a necessity. Its operation has proved to be efficient. With a water supply of 25 sec.-ft. it is possible to effect a continuous run of 10,000 bolts through the chute, flume and tunnel into the tailrace in eight hours.

Blind Slough Dam.

Before the improvement this most easterly and well-elevated portion of the old river bed was closed by a small rock-filled timber crib structure with ten 6 by 14 ft. sluices which served as an auxiliary spillway. Raising of the water level caused the abandonment of this old dam and the construction of a concrete dam 640 feet long. This new dam consists of a series of heavy piers with 14 spillway bays between piers. It contains 20,000 cu. yd. of concrete. Ten of the 20 by 28-ft. bays are closed with stoplogs and the remaining four, on the west end, are closed with the Tainter gates removed from the intake dam. The openings which these gates control were reduced to 19 ft. 6 in. by 19 ft. $\frac{1}{2}$ in. The sills of the ten bays are at El. 320 and those of the latter four bays at El. 294. The operating winches for the Tainter gates and a motor-generator set for supplying the local power are located in a gate house erected upon the deck of the dam. Each winch is operated by an 8-hp., 125-volt, d. c. motor.

With the water level at 340 the combined discharge capacity of these 14 spillway openings is 96,000 sec.-ft. The largest flood ever recorded for the river occurred in 1921, and mounted to about 60,000 sec.-ft.

Upstream from the face of the dam slots are provided to accommodate the traveling emergency gate. This emergency gate may be placed in any of the openings to relieve a gate for repair or adjustment. This gate is of the fixed-roller type, quite similar in design to the penstock intake gates previously described. When not in use the emergency gate is lifted clear of and stored at the end of the dam. The stoplogs are of timber, two pieces bolted together with a steel stiffening plate between. The stoplog machine formerly used at the old sluice dam is used to handle these logs.

Extending across above the crest of all of the dams is a 16-ft. roadway to accommodate travel.

Initial arrangements provided for a maximum of

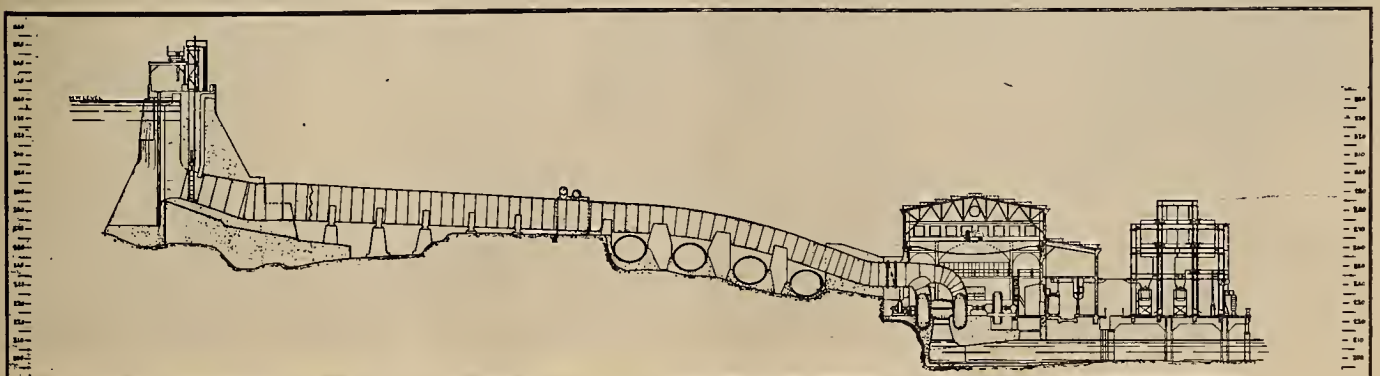


Fig. 3.—Cross-section through fifth unit and along the line of the penstock for that unit.

four 14-ft. 6-in. penstocks, the average length of which is 190 ft. This condition made necessary the selection of a new location for the installation of the fifth penstock. Several different plans were considered, among them being that of placing the fifth unit in a separate building immediately below the main dam. Control and other complications, however, caused the adoption of the plan to extend the power house westward into the solid rock and install the new unit at that end of the power house. This arrangement of units made necessary the crossing of the four original penstock lines by the fifth. Hence the new line emerges from the main dam as previously mentioned and is carried across the other four lines to the position of the fifth unit at the west end of the power house building. A double bend thus is necessitated, something of an S curve. Suitable piers are provided to carry the new line. The new line is 20 ft. in diameter at the intake end and tapers continuously through its 324-ft. length to a diameter of 13 ft. at the butterfly valve at the power house wall.

Machinery.

The four original turbines are of the double horizontal Francis type with central discharge. They operate at 225 r.p.m., and are enclosed in 18-ft. cylindrical casings, to which the penstocks are connected axially. These casings are of $\frac{3}{4}$ -in. steel plate with heavy forged steel flanges and a cast steel end-plate designed to take the full hydraulic thrust. Runners are 63 in. in diameter, built of steel plates cast into a steel hub. Bearings are water-cooled. Draft tubes are moulded carefully in concrete and are expanded from an 8-ft. circle at the point of contact with the casing to a 9-ft. 5-in. by 21-ft. 9-in. rectangular opening at the dis-

charge end. These turbines were supplied by the Escher Wyss Company of Switzerland.

Four high-pressure oil-operated governors of the same make are supplied with oil at 300-lb. pressure from a central pumping station. Two pressure oil pumps driven by impulse wheels supplied with water from the exciter penstocks handle the oil. Either is capable of supplying all four governors.

Two 250-kw. 125-volt exciters are driven by 500-hp., single-runner, Francis type turbines, each fed by a 46-in. penstock.

The four original generators were supplied by the Canadian General Electric Company. They are 3-phase, 60-cycle, 4.4-kv., 225 r.p.m. machines and were originally rated at 8,825 kva. Tests made on one of these machines showed that the turbines were capable of developing 10,800 kva. Accordingly the four original generators were rebuilt by the manufacturer to that capacity.

The fifth unit turbine and governor were supplied by the Canadian Allis-Chalmers Company. The turbine is of the double-runner, spiral-casing, single-discharge, horizontal type, operating at 225 r. p. m. Its normal rating is 15,000 hp. and its efficiency guaranteed at 80 per cent for full load and 87 per cent at .85 per cent load. Because of the fact that the penstock for this unit had to come in over the existing penstock lines and consequently at a greater elevation it was impossible to install a unit similar to the original four. The fifth unit penstock comes in above the unit and is split to serve the two wheels.

A normal rating of 13,125 kva. and a two-hour overload rating of 16,400 kva. is ascribed to the number five generator unit. This unit, together with its attendant transformer and switching equipment, was manufactured by the Canadian

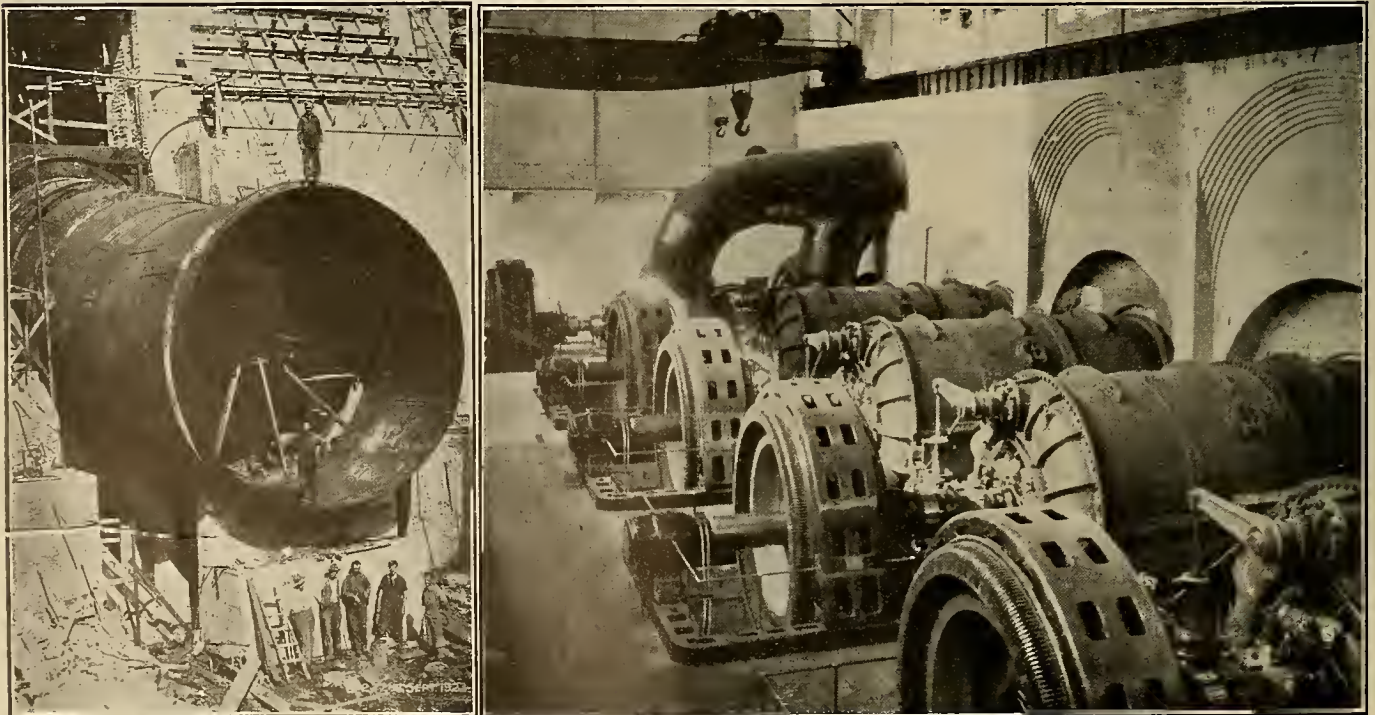


Fig. 4.—Left: Penstock for fifth unit showing size of pipe. Right: Interior of power house showing the four original units in the foreground and the fifth unit in the background.

General Electric Company. Excitation for the new unit is provided by a 400-kw., 125-volt direct-connected exciter. The capacity of this exciter is sufficient to supply all five generators. A bank of three 5,500-kva., 460-kv. transformers connects the generating unit to the 60-kv. buses. These transformers are designed to operate in parallel with existing transformers either singly or in banks. One spare transformer unit is provided.

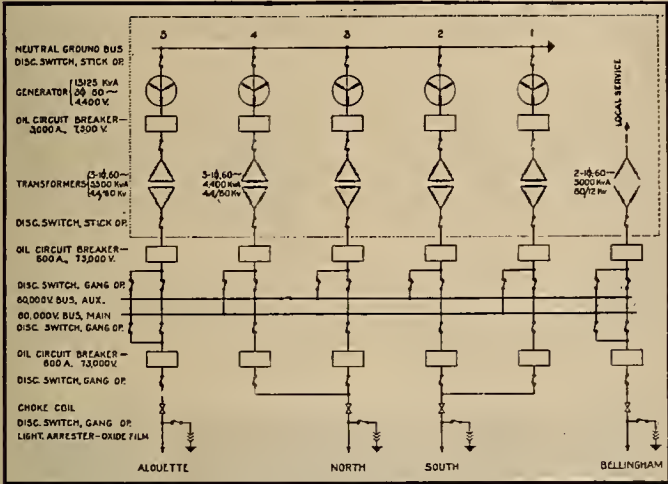


Fig. 5.—One-line wiring diagram of electrical connections. The equipment shown within the dotted lines is mounted in the outdoor switch rack.

Switching Equipment.

Standard practice is followed in the arrangement of the switching equipment. Each generator, with its transformer bank, is considered and treated as a unit, all five units being tied together on the 60-kv. buses. Between each generator and its transformer is an oil circuit breaker, type H-206, rated at 3,000 amp. and 7.5 kv., which serves for synchronizing and for isolating the generator in case of transformer trouble. Between each transformer bank and the high-tension buses is an oil circuit breaker, type FHKO-136, rated at 600 amp. and 73 kv., and two sets of bus-selector air-break switches, Pacific Electric 600 amp., 73 kv. switches. These air-break disconnecting switches are gang operated and manually controlled from the operating floor through a system of rods.

Generators are star-connected with the neutral leads brought out to provide for the installation of current transformers for differential relay protection. Neutrals are made up outside of the current transformers and are grounded solidly. Generators are protected from overspeed by an overspeed device on the shaft and by frequency relays. Each transformer bank is protected by differentially connected relays, and the generators are further protected by overcurrent relays.

In addition to the equipment necessary for the controlling of the local units and circuits, provision is made to handle the output of the Alouette plant when it is completed. The Alouette plant is to be semi-automatic and will be treated at Stave Falls as if it were a local generating unit, tied to the high-tension buses in a similar manner.

Two 60-kv. buses are installed to give the de-

sired flexibility of operation. These are tied to the generating units as already described. Feeding from these buses are three transmission circuits. Two of these are the main feeders from the station and carry the bulk of the power to the Vancouver load center. These two lines are equipped with induction-type balanced current relays and overcurrent relays. The third circuit serves at the present time as a tie with the system of the Puget Sound Power & Light Company at Bellingham, Wash. Provision is made, however, for its ultimate use as one of a pair of lines to handle the output of the Ruskin development when that portion of the project is undertaken. Overcurrent relays also are provided on this line.

Because of the importance of the two lines first mentioned they are each equipped with an oil circuit breaker for each of the two buses at Stave Falls. The Bellingham line is equipped with only one oil circuit breaker on one bus, disconnecting switches being used for the other bus. Transmission and tie lines are equipped with choke coils and with lightning arresters of the oxide-film type.

Station light and power are provided by a bank of 60/12-kv. transformers fed from the 60-kv. bus.

Station Building and Miscellaneous.

The power house building is a reinforced concrete structure 100 ft. wide and 215 ft. long, including the addition for the fifth unit. It is located in the westerly channel of the old river and is some 200 ft. downstream from the intake dam. Foundations rest upon solid rock. In fact, the excavation of some 58,000 cu. yd. of rock was required to prepare for the foundations. The switch-board bay extends along the east end of the building at an elevation of some 21 ft. above the generator floor. This location provides an unobstructed view of the generating floor and all of the machines and low-tension oil circuit breakers.

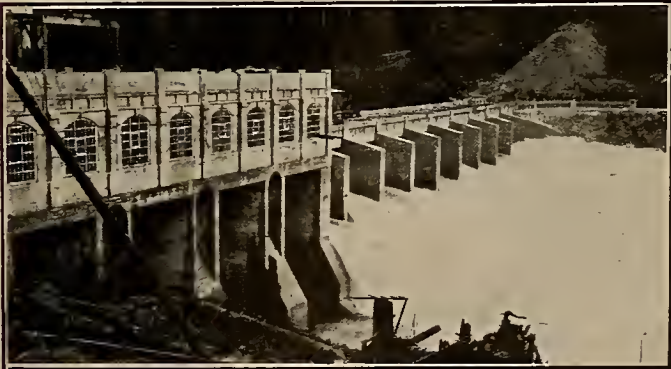


Fig. 6.—Flood discharge through the Blind Slough dam. The four bays at the left are controlled by Tainter radial gates. Provisions for the 16-ft. highway roadway are shown.

The main switchboard faces the gallery. In addition to the usual run of instruments this board is fitted with five eight-point graphic temperature recorders. These are arranged to indicate and to record the temperatures of the generator stator winding and the oil temperature of the corresponding transformer bank. An auxiliary board behind the main board carries the relays and the station

service control equipment. Directly beneath the gallery is the d. c. room, where the exciter output is centralized and re-distributed. Generator field rheostats also are located in this d. c. room.

Immediately in front of the station, on the downstream side, is the new 60-kv. outdoor bus and switch rack. This structure is supported on a reinforced concrete slab 68 by 160 ft. in dimension carried on piers set in the tailrace. The superstructure is of latticed steel towers and girders, is 50 by 153 ft. in plan, and has a maximum height of 62 ft.

The tailrace is excavated in the old river channel for a distance of 1,500 ft. to its junction with the main river. It is 70 ft. wide, and its construction entailed the excavation of some 22,000 cu. yd. of rock and 75,000 cu. yd. of other material. A V-shaped weir constructed to regulate the depth of the tail water is set in the channel about 100 ft. downstream from the power house wall. The normal elevation of the tail water is 210.

Efficiency.

With a plant efficiency of 78 per cent, allowing for all machine and penstock losses, the 4,200 sec.-ft. flow is capable of generating 32,000 kw. continuously, and the total annual plant output will closely approximate 280,000,000 kw-hr. This will be the condition when the Alouette plant is completed. With the fifth unit in operation the plant has an installed capacity of 65,625 kva. At 0.9 power factor the peak load capacity is 59,000 kw. Owing to the limited turbine capacity, however, it is believed that a peak capacity of not greater than 54,000 kw. will be the average under conditions of average head. Thus the plant can operate on an average annual load factor of 59.1 per cent. The load factor of the system approximates 50 per cent.

Measuring Glacial Movement on Mt. Hood with Markers Located by Transit

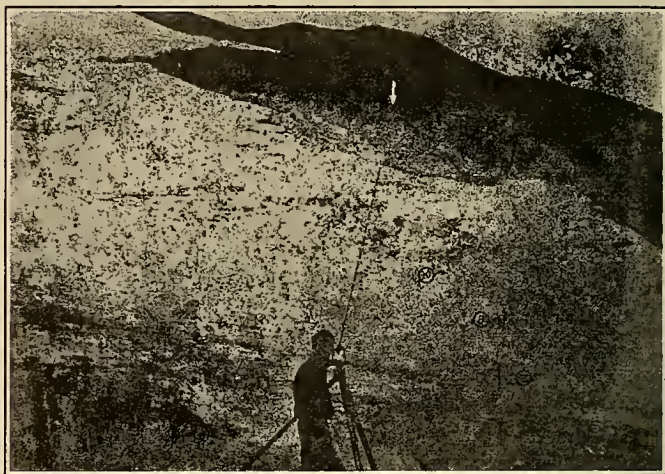
MEASUREMENT of ice flow in the glaciers of Mt. Hood near Portland, Ore., has been begun recently by the research committee of "Mazamas," an Oregon organization of mountaineers. The plan of observation is to run lines across a glacier with a transit, mark a number of points in the ice, and then re-run the same lines from time to time measuring the movement of the marked points.

The work has been done chiefly on Eliot glacier on the north side of the mountain which, the committee states in reporting on its 1925 work in the club's annual magazine, "was selected for observation because it is a typical glacier, has most of the characteristics common to mountain glaciers and is the longest ice stream on the mountain." Lines were run this year at El. 7,800 and El. 7,200 and were re-run every three weeks for a period of nine weeks. At the higher level where the glacier is 2,400 ft. wide, 11 stakes were set, some in packed snow and others, where ice was exposed, were put in holes drilled in the ice by hand with an ordinary rock drill bit welded to the end of a length of iron pipe.

"A most noticeable feature," the committee states, "was the rapid melting of the ice in the central part of the glacier. About one foot per week of solid ice melted during the first six weeks of observation. During the second period of three weeks several stakes that had been sunk 4 ft. into the solid ice had melted out and fallen down. This melting of the ice constitutes our greatest problem in measuring the flow. It is very hard work to drill the holes, the vigorous effort of two men for about an hour being required to drill a hole 4 ft. deep.

"The committee tried several kinds of drill points but has reached no conclusion as to the best type. After the holes were started, water was poured in to float out the ice chips. It was found that the presence of water greatly facilitated the drilling.

"The committee plans to try various types of metal plates as ice markers. The problem will be to get one of suitable thickness to transmit such



Measuring glacial flow on Mt. Hood. Dotted line from the transit indicates initial position of stakes. Locations indicated by circled figures show later positions of same points.

an amount of heat to the ice beneath that it will melt at the same rate as the surrounding surface. At the same time the marker must be of sufficient weight to not blow away."

The maximum movement of ice observed was about two-thirds the way across from the southeasterly side of the glacier, where there was a uniform flow of about $7\frac{1}{2}$ in. daily during the nine-week period when observations were possible. From this maximum the movement decreased to a minimum in the stake nearest the edge, which moved $1\frac{3}{4}$ in. daily in the first period, $2\frac{1}{4}$ in. in the next period, and 1 in. in the third period, this movement corresponding to some extent to temperatures prevalent during these periods.

Measurements were continued into the fall until snow prevented further observation. The markers were anchored well for the winter so they can be located next spring to determine the amount of winter flow. It is proposed to initiate next season similar observations on other of the more accessible glaciers on the mountain.

Advantages of Unit-Drive System Shown in Reorganized Factory

POWER companies, motor manufacturers, electrical engineers and contractors are finding a great market for their services and products in plants equipped with overhead drive systems of power distribution. Many such plants were constructed before the production of electric power had reached its present large proportions. There was no widespread and organized effort to acquaint manufacturers with the advantages of the unit-drive system by electric motors. Today the large power companies and manufacturers of electrical equipment have elaborate campaigns functioning for the development of industrial power business. Co-operation with the efforts of electrical engineers and dealers in motors and other supplies has been developed to a high degree, with the result that the entire industrial field in the West now is being canvassed thoroughly.

The fact that large and important concerns will scrap an existing overhead system and replace it with a motor for each machine is perhaps the most conclusive proof of the advantages of the unit system which can be cited. Such results can be secured, of course, only in fields where the benefits to be derived are many, and it is on that basis that the unit drive is gaining ground.

Economy of power is undoubtedly the point of greatest interest which the proponents of the individual motor drive can advance to a manufacturer. It is one which registers quickly, too, for one look at a ceiling of idly turning shafting, spinning pulleys and whizzing belts discovers volumes in favor of motors connected to each machine by direct attachment, gears or a short belt or chain. The labor saved by eliminating the need of oiling and keeping up long lines of shafting is also an important item.

Careful attention to spotting machines, according to the normal path of production, also has developed one of the great advantages of the unit-drive method. The flexibility of this method adapts it readily to even the most erratic demands along that line.

Further impetus has been given to the development of unit-drive systems by the inauguration of safety laws and campaigns along that line. Even

WITH the development of the unit-drive system by electric motors for large industrial installations, a new market has been opened for the services of power companies, motor manufacturers, electrical engineers and contractors. Co-operation between these groups has been developed to a high degree, and the entire industrial field in the West is being canvassed. One outstanding reorganization was completed recently in the Oakland factory of the Fageol Motors Company. The details of this installation are described in this article.

an extensive outlay for protective devices will not entirely safeguard all the employees in a plant operated with an overhead drive. The psychological effect alone of being surrounded on all sides and overhead by a network of fast-moving and noisy objects is a detriment to the health of workers and a brake upon production. Slower movements are the natural result of fear, even though it is a sensation of which a man may not be conscious.

The unit-drive also scores from the standpoint of improved lighting. The

amount of light which is cut off by shafts, belts and pulleys can be visualized only by a comparison of similar plants under the opposite methods of supplying power to the machines. This may be seen in Figs. 1 and 2. Since the speed of production, amount of spoilage, safety and general efficiency are influenced largely by the lighting, any improvement to be secured by individual motors at each machine is worth considering.

All of the factors which enter into a comparison of overhead and unit-drive systems have been worked out and may be seen in actual practice in the Oakland factory of the Fageol Motors Company. Increased production facilities became necessary, and last year in doubling the capacity of the factory, most of which was built when the company was incorporated in 1916, consideration was given to the merits of the motor-drive plan.

The plans for the expansion of the Fageol factory called for the rehousing of practically every department except the machine shop. In some cases this involved the erection of a new building around machines which were to continue production without changing their location. In other instances entire departments were to be placed in new quarters in another part of the plant. The machine shop only was to remain undisturbed, and there only, it was decided, would the old overhead drive system be allowed to remain. For the balance of the factory specifications for a complete electrical power and lighting system were incorporated in the plans.

Not a power line will show above ground when the work of the electrical contractor is completed. Lead conduits will bring the current from the high

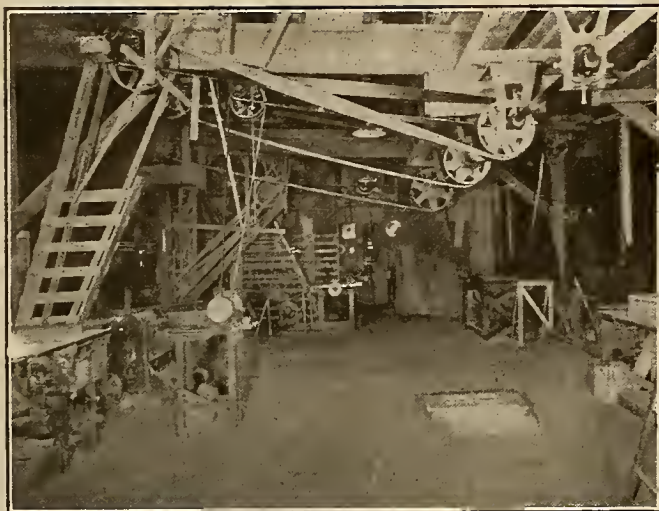


Fig. 1.—Cabinet shop before unit-drive system was installed, showing overhead system of pulleys and belts.



Fig. 2.—Cabinet shop after the unit-drive system was installed. Note the improved lighting system.

line into the new transformer vault and distribute it from there throughout the Fageol factory beneath the surface of the ground. Conduits in the concrete floors of the new buildings carry the lines direct to the machines to be served. The overhead space in every shop will be absolutely clear.

Three 100-kw. transformers in the vault step the 2,300-volt power brought in from the street down to 440 volts. Two leads run from each transformer, closing the delta right at the board, instead of using three leads to the delta. The whole installation is arranged so that the 100-kw. transformers may be replaced later with 200-kw. transformers without changing the wiring. As the vault will be kept under lock and key, open bus bars have been used overhead instead of heavy wires in a gutter to facilitate changes. These are shown in Fig. 5.

On the outside of each building a transformer has been placed to step down the power current for the lighting circuits. J. W. De Cou, factory superintendent, cites the lighting system as his especial pride, particularly the unit-control feature; that is, the placing of switches upon the pillars nearest the lights which it is desired to control. Formerly the switches all were grouped at the fuse box, and men

repeatedly would turn on and off half the lights in a building in their efforts to control the group lighting their work. By proper spacing of lamps and the use of reflectors an even light has been secured throughout the new buildings. "I have gone all through every shop with a barrel open on one end," Mr. De Cou states, "and have been unable to find any spot where I might set the barrel up so that its side would cast a shadow over the bottom. When a lighting system can pass a test like that you may be certain that your men will never be handicapped by the necessity of going about their work blindly in the shadow cast by their hands."

Another interesting feature is the auxiliary light on a flexible arm placed on certain machines where a close light right on the work is needed. It takes current from the power wire through a small transformer on the machine. Thus it is possible to have the light turned on only while the motor is running, and the wastage, which is common in most plants as a result of men turning on such lights and going off leaving them on, is avoided. Fig. 9 shows one of these installed on the quick-work former.

Power for the machines in each department is

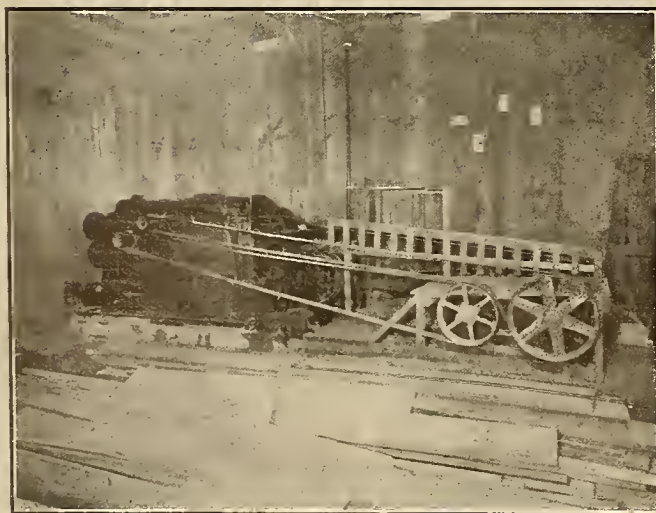


Fig. 3.—Cumbersome belt-drive connected to planer in old installation.

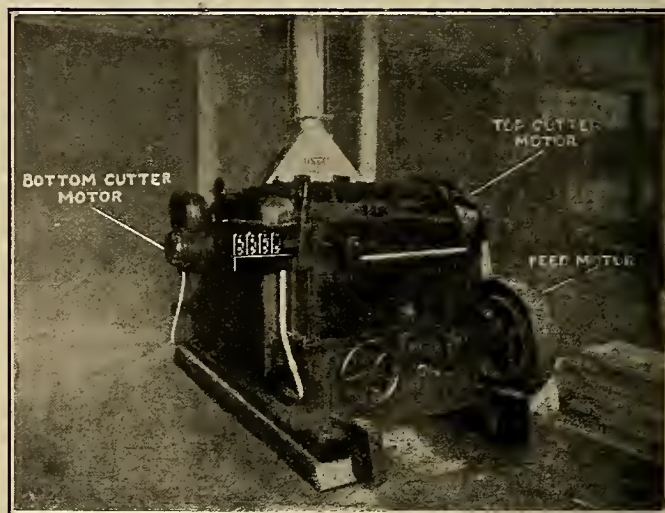


Fig. 4.—The motor was made an integral part of the new planer.

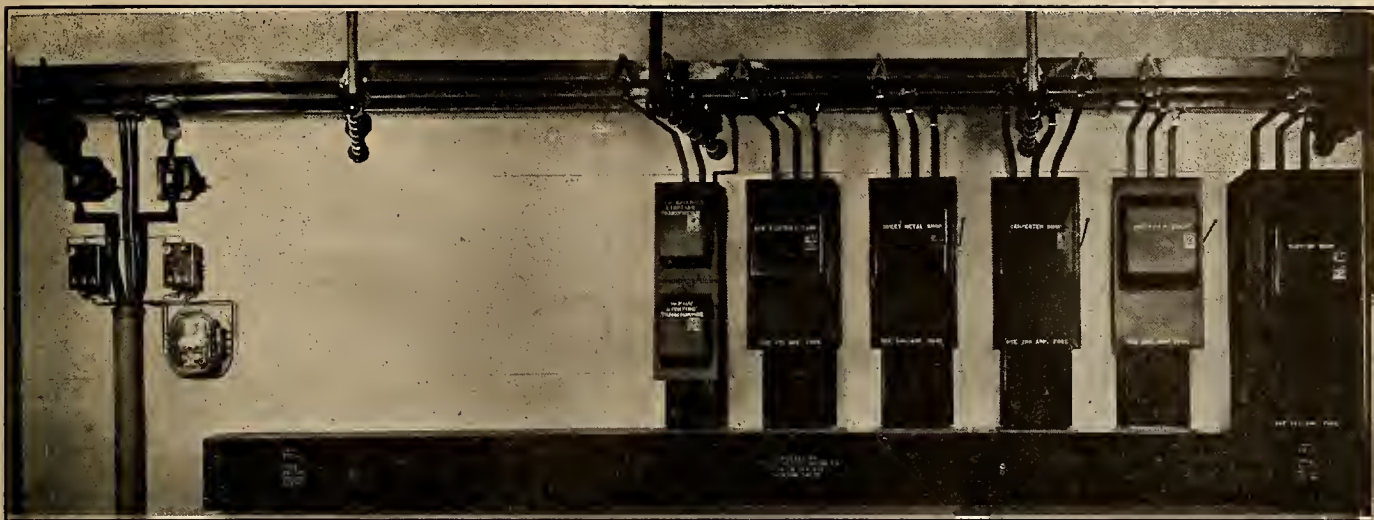


Fig. 5.—Transformer room and main switchboard. As this room is locked, open bus bars were used overhead instead of heavy wires in a gutter in order to facilitate changes.

distributed through a central control board and controlled by push buttons placed conveniently at the operating positions. In adapting this system and individual motor-drive to the various pieces of machinery, many problems were encountered which had to be solved by special engineering worked out right on the job. A number of typical instances will be cited.

On the large planer provision had to be made for the removal of the knives for sharpening. For that reason it was necessary to mount the motor on the machine and make it an integral part of the planer. The desired result was accomplished by tearing down the whole motor, removing the bearing at one end, and mounting the whole thing on the shaft of the planer.

The pony planer was seldom used when belt-driven, because the belts used to slip and trim the boards in wavy lines. Now, with two motors operating it, one feeding and one driving, it is a very popular machine and does fine work. A quick-work former also was laid out for two motors because it had to operate in two directions under control of

two foot pedals. But one motor and two clutches, one working on a gear and the other on a silent chain, solved that problem.

One of the most complicated machines to be adapted to the unit-drive system was a sander. Three motions or directions had to be given to the drum—up and down, endwise and revolving. Double thermoid couplings spaced twelve inches apart allowed for the up-and-down motion. Then the rotor shoulder was turned back on the shaft so the rotor could oscillate in the bearing and permit the motor to swing free in the stator to take care of the endwise motion while at the same time providing the rotary motion, of course.

Kick-button control on drills; three motors on a surfer, each with an individual control push button, but an emergency stop button controlling all three; and three-phase motors on bench drills instead of single-phase, thus providing more constant and dependable driving power, are other interesting features in the Fageol plant which go to show that modern ingenuity can meet practically any conditions.

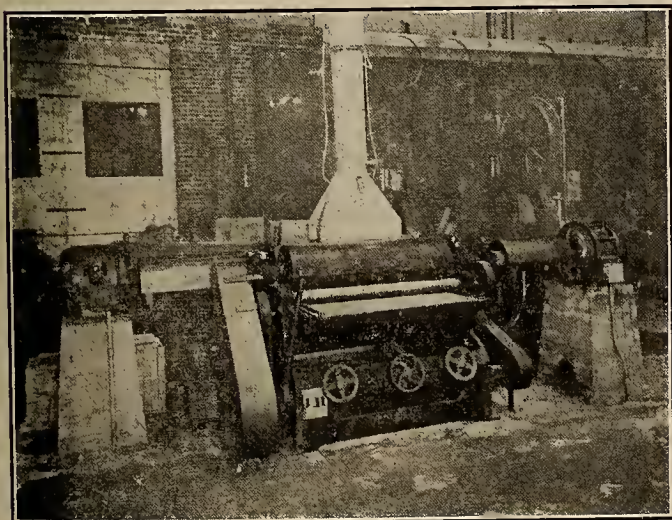


Fig. 6.—The sander was one of the most complicated machines to be adapted to the unit-drive system in that three motions or directions had to be given the drum—up-and-down, endwise and revolving.

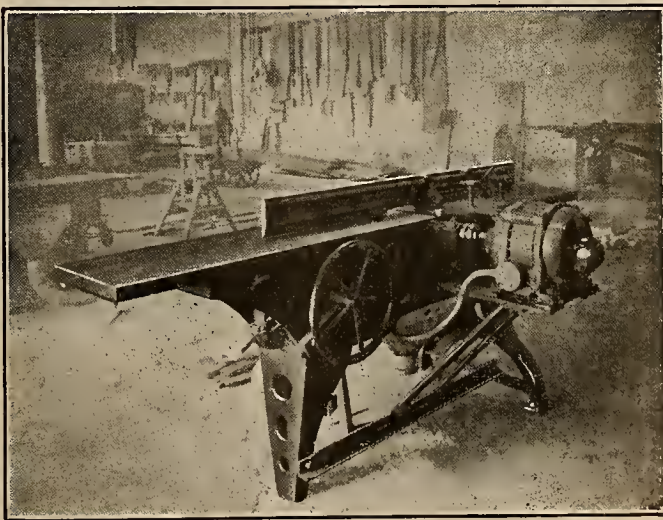


Fig. 7.—The pony planer was seldom used when belt-driven because the belts used to slip and trim the boards in wavy lines. Now with two motors operating it, one feeding and one driving, it works well.

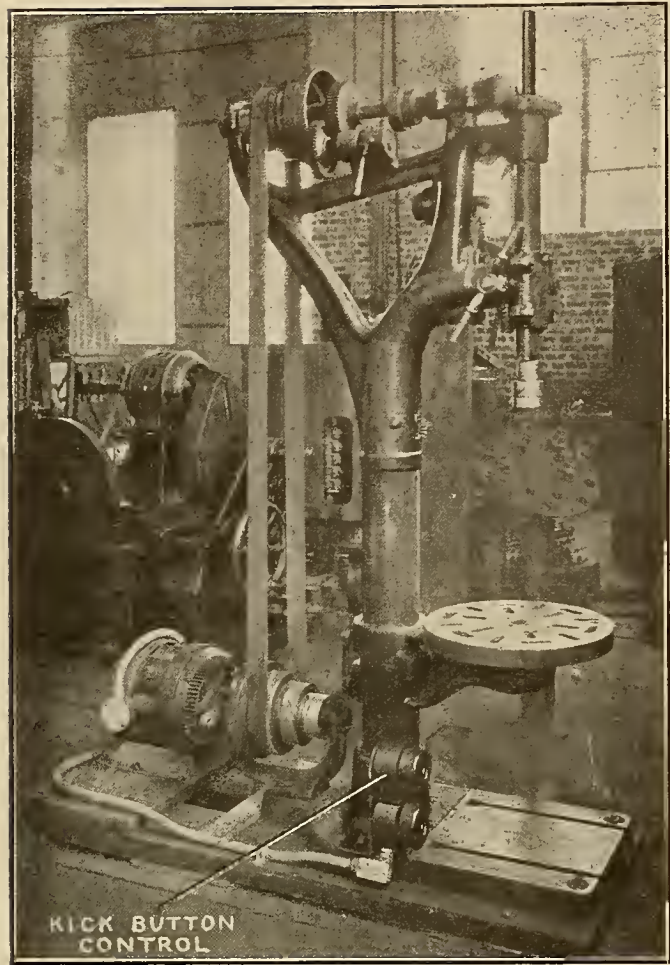


Fig. 8.—Drill press with kick-button control.

was 131.4 kw., or 176.1 hp., with a consumption of 25,680 kw-hr., when 484.5 hp. was connected. The installation was not completed at this time and a considerably larger load now is connected. Part of the load was operating with the overhead drive and part with the unit-drive.

Table I.—Operating Data of the Fageol Motors Company.

Month	Kw.	Demand Hp.	Kw-hr.	Hp. Con- nected
April, 1925.....	126.	168.9	23,040	239.8
May, 1925.....	126.	168.9	25,920	
June, 1925.....	147.6	197.9	32,880	
July, 1925.....	133.2	178.6	34,560	368.8
August, 1925....	129.6	173.7	27,120	
Sept., 1925.....	118.8	159.2	23,040	
October, 1925....	115.2	154.4	18,000	
Nov., 1925.....	131.4	176.1	25,680	484.5
Dec., 1925.....	151.2	202.7	28,560	
Jan., 1926.....	162.	217.2	27,360	

However, these figures may be taken as an indication of the results that may be expected with a transformation from the overhead to the unit-drive in installations of this type. The connected load may be increased considerably without proportionately increasing the demand factor or the total kw-hr. consumed. As in this case with the connected load doubled, the demand was increased only 4.3 per cent, and the kilowatt-hours consumed were increased only 11.5 per cent.

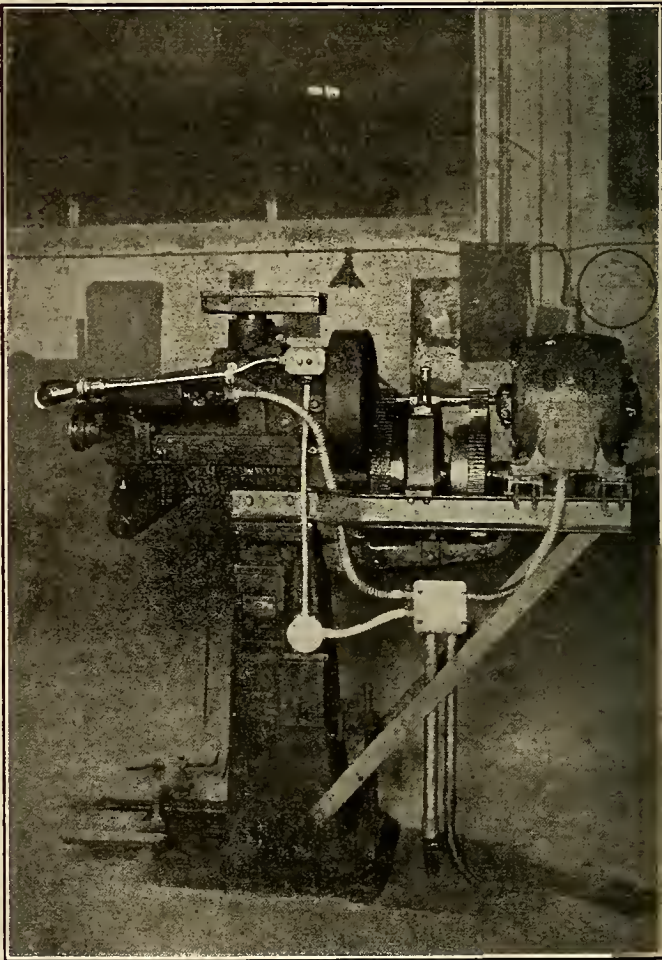


Fig. 9.—Quick work former showing an auxiliary lamp on a flexible arm.

To handle this work it was necessary for the electrical contractor to maintain a force at the Fageol factory throughout 1925 and vary its size according to the progress being made on the new buildings and the work required of different departments. This installation was made by the Pacific Electric Motor Company of Oakland.

Although no figures are available showing the power factor with the overhead drive system as compared with the unit-drive system, it is thought that this would be considerably higher with the unit-drive system. This would be due to the fact that a motor driving a line shaft would be only partially loaded a great deal of the time; when this is true the power factor is low. With the unit-drive system each motor would be operating at more nearly full load with a resulting higher power factor.

In studying the relative merits of group versus individual motor drive one of the most important considerations is the question of power consumption and first cost. Individual motor drive also results in maximum freedom from obstruction and has other advantages that contribute to operating flexibility and economy of power, especially when part of the plant is run overtime.

In April, 1925, the demand at this factory was 126 kw. or 168.9 hp., with a monthly consumption of 23,040 kw-hr. At this time there was a connected load of 239.8 hp. In November the demand

Tests on Steel and Wood Poles*

Part 2—Wood Poles

A series of tests was made of the strength of wood poles on March 17 and 18, 1925, at the Davis construction yard of the Pacific Gas and Electric Company. These tests were made at the same time as the tests of steel poles were made. The results of the tests of steel poles were given in Part I of this report.

The poles tested were of varying lengths and ages. However, all of them were Washington or Oregon red cedar, with but two exceptions. These latter two poles were full-length creosoted fir. A total of 14 wood poles were erected for tests and 10 of them actually tested.

Two purposes are in view in the making of this report:

1—To establish as far as possible the relative strength of cedar, fir and pine poles, new poles as well as those that have been in service for a number of years.

2—To continue the study of methods of and materials for the preservation of wood poles of all kinds.

Description of Tests

Pulls were made horizontally and at a point six in. from the top of the pole in all cases except one. That one test was made from the end of an 8-ft. crossarm placed 4 ft. 6 in. from the top of the pole, thus making the point of attachment approximately 3 ft. 6 in. from the center of the pole. This test was made on a full-length-treated red fir pole.

The strength of poles varied from 1,750 lb. for the older cedar poles to 3,250 lb. and upward for the new red fir poles. As will be noted in Table VIII no failures occurred in the test of the red fir poles and no failures on the shorter length red cedar poles. In many cases the softness of the ground permitted the pole to change its position in the ground to such an extent that further testing was useless. When this happened the pull produced tension in as well as bending of the pole and the final results obtained are of little value as far as the actual strength of the timber is concerned.

All holes were dug by the earth-boring machine of the Pacific Gas and Electric Company and had a minimum diameter of 18 in. Holes were dug 5 ft. 6 in. in depth for 35-ft. poles and 6 in. deeper for each additional 5 ft. length of pole. When poles were placed earth was replaced and tamped carefully, re-

storing it as nearly as possible to normal conditions, and the poles allowed to stand for 10 to 12 days before the final tests were made. The ground was heavy alluvial soil and quite damp. The movement of the poles in the earth would compare quite closely with conditions under normal winter weather after heavy rains, but would not represent the conditions that would exist during the dry summer weather when the earth becomes quite hard.

Test rigging was the same as that used in making the tests on the latticed steel poles, described in Section 1 of this report.

Deflections of the top of the pole were measured by means of a rope carried to the double-pole test structure and over a pulley to a suspended weight. The movement of the weight gave a direct indication of the deflection. The ground line deflections and deflection angles were read with a transit by noting the horizontal movement of one nail set at the ground line and another set 2 ft. above.

Wood Pole Preservation

To the user of wood poles the question of preservative treatment is of vital importance. It means the buying of fewer poles; less trouble after they are set in lines; and fewer replacements with the resultant expense, inconvenience and impaired service.

In most instances the life of a wood pole is determined by its life at and below the ground line. The number of years a pole is useful varies in different soils and under different conditions. The Pacific Gas and Electric Company has untreated poles which have been in service from 15 to 20 years and now are in better condition below the ground line than at the top. However, these conditions are the exception. Table IX gives a comparison of the length of life of different woods in the ground.

The normal life of wood can be estimated only in the broadest terms for obvious reasons. Some woods naturally are more durable than others and last longer under similar service conditions. Even the durable woods sometimes give out in a relatively short time if they are exposed to particularly unfavorable conditions. Wood that is kept dry will last for years and wood that is kept thoroughly wet also will last for years. In other words the kind of wood, the kind of service and the conditions of service determine the period of use which reasonably may be expected.

Economy is effected by preservative treatment whenever the annual charge against the treated timber is less than the annual charge against any untreated timber which would serve the same purpose.

*Serial report of poles subcommittee of the overhead systems committee, P.C.E.A. (Prepared by 1924-5 subcommittee, but publication delayed.) Subcommittee personnel as given with Part I in the Feb. 15 issue of the Journal of Electricity.

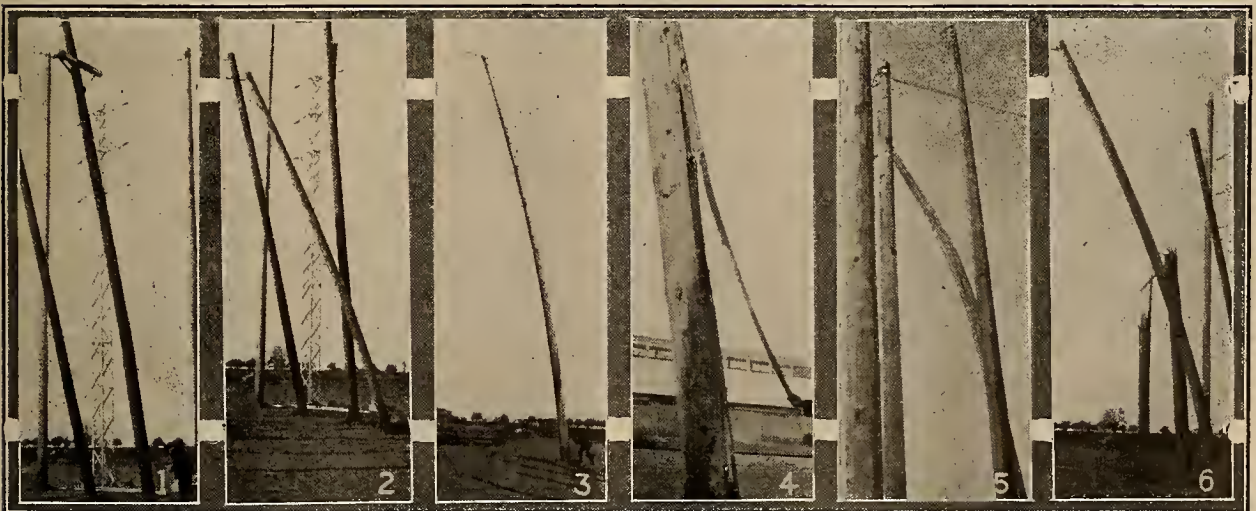


Fig. 8.—(1) 2,500-lb. pull on cross-arm, new full-length-treated red fir pole. (2) 2,000-lb. pull on new butt-treated cedar pole. (3) 2,500-lb. pull on new butt-treated cedar pole. (4) Break at 2,800-lb. pull on new butt-treated cedar pole. (5) Crack at 2,120-lb. pull on salvaged cedar pole 8 years old. (6) 2,800-lb. pull on salvaged cedar pole 9 years old.

The annual charge (r) can be computed from the formula:

$$r = \frac{PR(1+P)^n}{(1+P)^n - 1}$$

where R=Initial expenditure, P=rate of interest in per cent divided by 100 (usually 0.05), n=life in years. This considers an annual charge sufficient to pay the interest on the first cost of the pole plus a balance which, with interest compounded annually, will provide a fund at the end of n years equal to the first cost.

Treatments and Preservatives

The most common methods of pole treatments with preservatives are: 1—Brush treatment. 2—Open-tank treatment with either a hot solution or a cold solution. 3—Pressure treatment with either the full-cell process (12-lb. treatment) or the empty-cell process (8-lb. treatment).

A brief discussion of several preservatives is given in the following paragraphs:

Zinc Chloride—Tests have shown that up to the present time creosote is the best preservative. Other preservatives have been tried in the past. Zinc chloride is a valuable preservative but attacks the metal walls of the treating plants and also leaches out. A new zinc-chloride process has been developed recently that uses the pressure method in one operation. In this case an emulsion of zinc chloride with petroleum oil is used. The object of the petroleum oil in conjunction with the zinc chloride is to weatherproof the timber so treated.

Basilit—This is another valuable preservative. It can be used only in cold solution.

Wolman Salts—This compound is a wood preservative developed in Germany and which came into general use in central Europe between 1902 and 1908. It has been introduced just recently into this country by the American Wood Impregnation Company of New York under the trade names of Minolith, Triolith and Tanalith. This company expects to extend plant operations to the Pacific Coast very soon. Minolith in ad-

TABLE VIII.

Test No.	Type of Pole	Age in Years	Elevation of pull point above ground	Pole Depth in Ground	Pole Diameter (Inches)		Pull-Load in Lbs.	Center-Line Deflections					Diam. of Hole dug	Deflection at end of crossarm	Remarks									
					Top	Butt		At Ground	At Elev. of Pull	Angle of deflection at ground														
										Ft.	Inches	(Ft.)				Deg.	Min.	(Inches)	(Ft.)					
2	Full length Treated Red Fir	New	42.0	7	10	14	500	$\frac{7}{16}$	1.9	0	42	24		Breast pull only applied. Pole appeared sound. 50 ft. pole.										
							1,250	$2\frac{1}{4}$	4.6	2	47													
							1,750	$5\frac{3}{8}$	7.7	5	32													
							2,250	$8\frac{1}{2}$	10.6	8	59													
							2,750	$10\frac{3}{4}$	14.6	13	27													
							3,250	$14\frac{1}{2}$	18.3	17	48													
3	Full length Treated Red Fir	New	38.0	7	$8\frac{1}{2}$	14	750	$\frac{5}{16}$	1.05	0	30	24	3.0	Pull applied at end of cross arm, 13 ft. 6 in. from center line of pole. Crossarm was $5\frac{3}{4}$ x $5\frac{3}{4}$ in. and attached to pole by $2\frac{3}{4}$ in. bolts 6 in. apart with $1\frac{3}{4}$ in. x $2\frac{3}{4}$ in. wood quarter-braces. Crossarm was 4 ft. 6 in. down from top of pole.										
							1,500	$2\frac{1}{2}$	3.5	3	05													
							0	$2\frac{1}{2}$	1.95	2	11													
							Pull was released to re-attach hook																	
							1,500	$3\frac{3}{8}$	3.7	3	29													
							2,000	$5\frac{1}{2}$	5.0	4	53													
							2,500	$8\frac{3}{4}$	7.5	8	11													
							The crossarm rotated more than 45 degrees including considerable twist of the pole in the ground.																	
							The deflections at the end of the crossarm were taken by plumbob on the pull-line and are subject to error. No sign of failure in either pole or crossarm appeared. Angle-of-deflection readings at ground are subject to error due to twist of pole in ground. 50 ft. pole.																	
							4	Butt-treated cedar	New	33.75	6				$7\frac{1}{2}$	12	750	$\frac{7}{8}$	2.9	0	42	24		40 ft. pole.
1,500	$5\frac{1}{4}$	8.5	3	11																				
2,000	$10\frac{3}{4}$	11.05	14	16																				
2,200	1	0	12.85	26	37																			
5	Butt-treated cedar	New	28.75	5	8	12						750	$\frac{9}{16}$	1.6			1	6	24		35 ft. pole.			
												1,500	$3\frac{1}{4}$	4.4			4	47						
							2,000	$8\frac{3}{8}$	8.3	10	55													
							2,500	1	$23\frac{1}{4}$	12.0	19	17												
							2,900	1	$11\frac{1}{4}$	17.0	36	10												
							Pole leaned over (due to ground giving) so far test was stopped.																	
8	Butt-treated cedar	New	51.75	8	8	20	450	$\frac{1}{2}$	1.4	0	59	24		60 ft. pole.										
							950	$2\frac{1}{8}$	3.55	2	53													
							1,740	$4\frac{1}{2}$	7.3	4	21													
							2,300	$8\frac{1}{8}$	11.4	9	18													
							2,800	Not taken	16.25	Not taken														
							3,140																	
9	Salvaged cedar	8	55.75	8.5	8	16	1,010	$\frac{3}{4}$	4.2	1	12	30		65 ft. poles.										
							1,850	$2\frac{3}{16}$	8.75	3	05													
							2,120	Failed																
10	Salvaged cedar	8	56.5	8.5	10	16	1,075	$\frac{7}{8}$	5.5	0	54	24		65 ft. pole.										
							1,850	4	10.7	4	11													
							2,440	7	15.1	6	47													
							2,950	Not taken	21.1	Not taken														
							3,050	Not taken		Not taken														
11	Salvaged cedar	9	42.75	7	$9\frac{1}{2}$	15	1,100	$\frac{3}{4}$	3.2	1	23	24		50 ft. pole.										
							1,550	$1\frac{7}{8}$	5.6	2	43													
							2,000	$5\frac{7}{8}$	10.0	6	11													
							2,500	$9\frac{3}{4}$	14.1	9	36													
							2,800	$11\frac{3}{4}$	16.3	11	13													
12	Salvaged cedar	9	42.5	7	8	17	750	$\frac{5}{16}$	2.15	0	42	24		50 ft. pole.										
							1,500	$2\frac{1}{4}$	5.15	3	11													
							2,000	1	10.0	14	16													
							2,500	1	$10\frac{5}{8}$	18.85	26				37									
13	Salvaged cedar	23	29.0	5.25	9	15	750	$\frac{11}{16}$	1.45	1	05	24		35 ft. pole.										
							1,500	$4\frac{3}{8}$	4.85	5	57													
							2,000	$11\frac{7}{8}$	10.45	15	30													
							2,500	1	6	14.95	24				24									

dition to its wood-preservative qualities is highly fire-resistant and is used for the preservation of mine timbers, building materials, fence posts, or wherever a high degree of fire retardation is desired. Triolith is used for railway ties, poles and crossarms. Tanalith, in addition to its preservative ingredients, has an admixture of poison salts for the additional protection of wood against fungi and animal destroyers



Fig. 7.—Cedar pole 8 years old; failed at 2,120 lb.

such as termites, wood worms and bore worms. These salts also contain dinitrophenol the same preservative used in creosote.

The full-cell process generally is used with this treatment and it is applied preferably to well-seasoned timber. About 1.8 per cent solution by weight is used. This is about 1 lb. of the salts to 60 lb. of water.

Service records show very favorable results in the use of Wolman salts as a wood preservative. Mining timber treated as far back as 1904 still is well preserved under unfavorable conditions. The advantages claimed for these salts are: 1—Highly toxic and preservative against all known fungi. 2—No reaction upon iron. 3—Thorough treatment throughout. 4—Clean and odorless. 5—Increases wood strength. 6—Can be painted over easily. 7—Wood can be cut after treatment without exposing untreated surface. 8—Will not leach out. 9—Fire retardant. 10—No change in present treating plants. 11—Cheap.

Table X gives a comparison of costs of creosote and Wolman salts for treating one cubic foot of wood.

TABLE IX.—Estimated life of railway crossies in place

Kind of Tie	Estimated Life in Years	
	Untreated	10 lb. Creosote per Cu. Ft.
Redwood.....	12	..
Cedar.....	11	..
Cypress.....	10	..
White Oak.....	8	..
Longleaf Pine.....	7	20
Douglas Fir.....	7	15
Western Larch.....	7	15
Tamarack.....	5	15
Hemlock.....	5	15
Chestnut.....	5	20
Red Oak.....	4	12
Beech.....	4	20
Birch.....	4	18
Maple.....	4	15
Lodgepole Pine.....	4	15
Western Pine.....	4	15
Loblolly Pine.....	3	15
Red Gum.....	3	16

Conductivity of Treated Poles

Several tests to determine the conductivity of wood poles were made recently by the Pacific Gas and Electric Company in its San Francisco test bureau. The purpose of these tests was to determine the relative conductivity of an untreated pole and a creosote-treated pole. Two ten-foot poles were used for this conductivity experiment. The untreated pole had an average diameter of 5¼ in. and the other an average diameter of 6¾ in. The average creosote penetration on the treated pole was 1¼ in.

Contacts or electrodes were formed by driving eight twenty-penny nails into the pole equally spaced around the circumference of the pole and driven in until their points met at the center. The heads of the nails were connected together and used as one terminal.

Two more electrodes of similar construction were placed in the pole, one 3 ft. and the other 9 ft. from the first. The same arrangement and spacing were used on each pole.

Resistance was measured between these three points by means of a high-resistance measuring set. The resistance of the 3-ft. section between the terminals designated as A and B and that of the 6-ft. section between the terminals B and C were used to check the resistance found in the 9-ft. section between A and C. A known high voltage next was applied to

TABLE X.—Amount of preservative for treating one cubic foot of wood pole by using Creosote and Wolman Salts

Kind of Preservative	Pounds of Preservative Per Cu. Ft. of Wood	Gallons of Preservative Per Cu. Ft. of Wood
Creosote (Full Cell or 12-lb. Treatment)...	12	1.381
Creosote (Empty Cell or 8-lb. Treatment)...	8	0.922
Wolman Salts Solution.....	12	1.4

Creosote ranges in price from 15 cents to 20 cents per gallon. Wolman Salts cost 25 cents per lb. for the 1.8 per cent solution used.

the 9-ft. length of each pole and the current measured through a Siemens-Halske 500/1 current transformer. This transformer had a primary full-load current of one milliamp. and a secondary or meter current of 0.5 amp. After these tests the two poles were buried in moist soil for a period of 20 days. They then were excavated and the resistance was again measured.

Results of the tests are given in Tables XI and XII. The resistance of the dry untreated pole was approximately 12 megohms per ft., whereas the creosote-impregnated pole gave a resistance of only 0.55 megohms per ft.

TABLE XI.—Electrical resistance of treated and untreated wood poles

Section	Resistance, in Megohms	
	Untreated Pole	Treated Pole
Resistance (when dry)		
A to B.....	44.1	4.9
B to C.....	73.4	.54
C to A.....	113.4	5.26
Resistance (after twenty day burial)		
A to B.....	.14	.38
B to C.....	.33	.05
C to A.....	.47	.43

After these poles were permitted to absorb a large quantity of moisture by being buried in moist soil the resistance fell to practically 0.05 megohm per ft. in each pole. Treatment apparently made no difference when the poles were damp.

Resistance measurements of the treated pole as measured with high-voltage a.c. checked very closely the values found by the use of the high-resistance measuring apparatus. However, the readings on the untreated pole were higher with the a.c. than the d.c.

TABLE XII.—Current in treated and untreated wood poles at high potential

E. M. F.	Current in Milliamperes	
	Treated Poles	Untreated Poles R, in Megohms
2,000.....	0.4	5
3,000.....	0.6	5
4,000.....	0.8	5
5,000.....	1.0	5.05
50,000.....	0.3	166.5
63,000.....	0.4	157.0
75,300.....	0.5	150.0
89,000.....	0.6	140.0
99,000.....	0.7	141.0

readings. This probably was due to the decomposition of the wood around the electrodes as a result of the comparatively high current forced through the pole by the high a.c. voltage.

Suggestions

It was impossible to secure sufficient information or to make any actual observations as to the results obtained through the Wolman-salts process of timber preservation or to form any conclusions as to its definite values as a direct competitor of the creosote treatment. However, it is believed that this preparation has sufficient merit to keep it on the live list for the work of a future subcommittee.

CENTRAL STATION CONSTRUCTION OPERATION AND MAINTENANCE

Power Company Communication Systems—III (b) Careful Co-ordination of Telephone-Line and Power-Line Transpositions Removes One Trouble Source

By H. N. Kalb,* Superintendent of Transmission and Communication, San Joaquin Light & Power Corporation, Fresno, Calif.

In view of the foregoing discussions the important part that leakage plays in good line service now should be well understood. At this point it is well to point out that in effect the insulator, wooden pin and wood pole are but three resistances in series between the conductor and ground. However, the pin and the pole each have less resistance when wet than when dry. Thus it is necessary to figure on each of these being of but low resistance and to depend upon the insulator resistance alone.

If 2-kv. insulators are placed on one wire of a telephone line and 60-kv. insulators are placed on the other wire of the same circuit, where the total length of line is perhaps 100 miles, there would be great unbalance in the circuit due to the unequal leakage. This is an exaggerated condition and is cited as an illustration that is fairly obvious. However, if pony glass insulators are placed on one wire of a circuit and 2-kv. porcelain insulators are placed on the other wire of the same circuit the result also will be an unbalance of harmful proportions.

If conditions arise wherein it is unavoidable to use dissimilar insulators on a telephone line, it is essential that all of the insulators on both conductors of any one circuit be the same on any one pole or structure. In other words, under the conditions specified, where part of the insulators might be of glass and part of porcelain, use the glass insulators on one pole and the porcelain insulators on the next pole, and so on. This will keep the leakage to ground from each conductor balanced even though it is not uniform along the length of the line.

Joints and splices must be good and they should be uniform. By a "good joint" is meant one that is mechanically strong and solid, giving a firm contact between wires and having a conductivity equal to that of the line wire itself. By "uniform" is meant that all joints should be alike in their size, length and conductivity. These conditions can be met best by the use of sleeves in the making of splices. If in the making of splices the wires are inserted into the sleeves until the tips of the wires are flush with the ends of the sleeves it is possible to test each joint with a definite pull. If the practice is followed of allowing the wires to protrude through the sleeves and then bending these ends back over the sleeves, a pull test will throw all of the strain on the sleeve itself and will give no indication of the quality of the joint. In the former case a pull on the joint throws the entire strain on the friction-hold of the sleeves and will show up any poor joints. Jumpers at dead-ends often are a source of trouble due to loose serving. These connections also should be watched.

Balanced exposure of telephone wires to adjacent power wires has been mentioned several times earlier in this treatise; that is, the two conductors of the telephone circuit so placed that they each receive the same amount of both electromagnetic and electrostatic induction. It is obvious that if both wires could occupy exactly the same space, at the same instant the problem would be solved automatically. This being impossible, the next best thing to do is to interchange the position of the wires. This is effected by transpositions. Proper transposing of a communication line is one

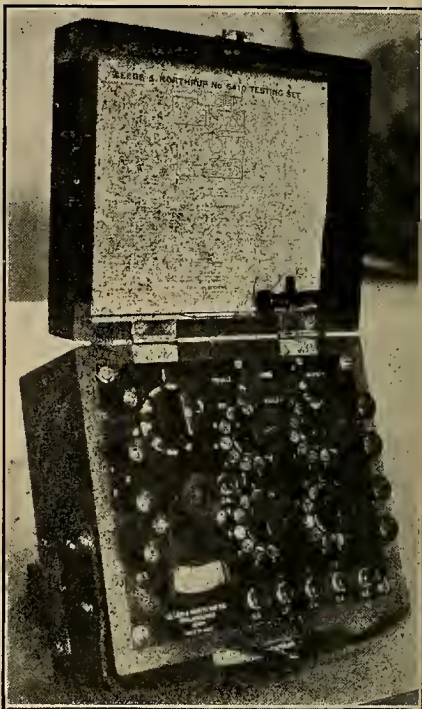
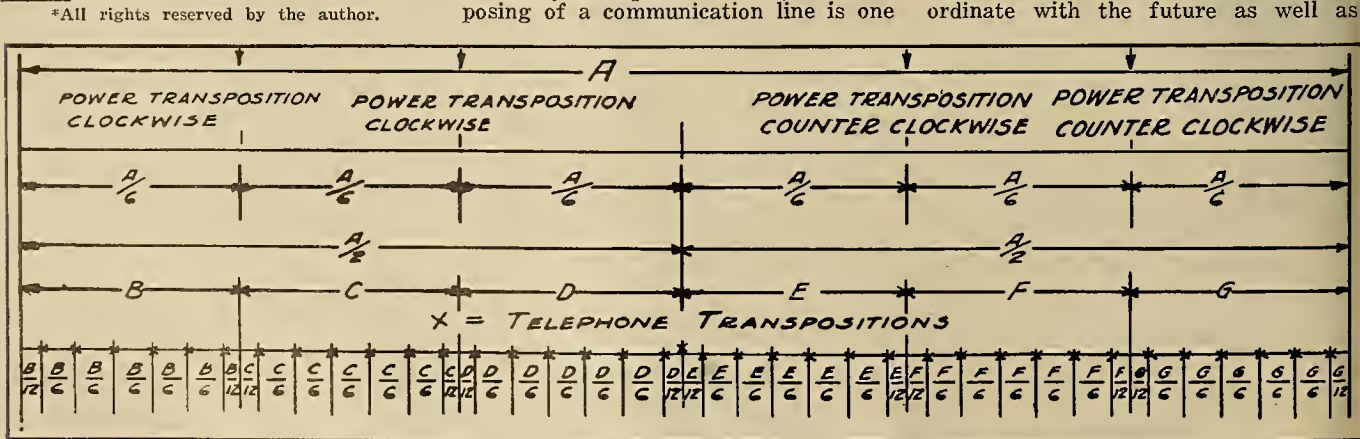


Fig. 22.—Leeds & Northrup testing set for use in routine maintenance of telephone equipment.

of the most important factors bearing upon good speech transmission results.

Transpositions in telephone circuits carried on power-line poles never should be farther apart than about 2,000 ft. for lines of 30 kv. and above and not over a half mile apart for lines of 10 kv. or lower. They may have to be as close as 600 or 700 ft. in some instances in order to co-ordinate properly with power circuit transpositions. Proper co-ordination between telephone and power circuits is essential in all cases for the best results. Consequently the telephone transpositions must be laid out to co-ordinate with the future as well as



with the present arrangements of power circuits as far as is possible. If the power wires are not transposed already the proper locations for the power transpositions should be determined. Then each transposition barrel in the power wires will be divided into three equal sections. These $\frac{1}{3}$ -sections then should be divided into an even number of parts, such as $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{6}$, $\frac{1}{8}$, or $\frac{1}{10}$ as the case may be. The length of each of these sub-sections should be about 1,600 ft., if possible.

A co-ordination scheme for transposing both power and telephone wires where there are but two barrels in the power wires is shown in Fig. 23. Each $\frac{1}{3}$ of the power barrel is considered as one complete telephone transposition section. This section is divided into transposition spans which in this case happen to number six. The first telephone transposition is placed not $\frac{1}{6}$, but $\frac{1}{12}$ of the transposition section, from the beginning, and the next and succeeding transpositions are each $\frac{1}{6}$ of the transposition section further along the line. This places the last one in the section a distance of $\frac{1}{12}$ of a transposition from the end of the section. No telephone transposition is placed at the end of this section as that is where the power wires transpose. However, as shown, at the junction of the two power barrels, one of which is clockwise and the other of which is counter-clockwise, there is no power transposition, and at this point the telephone wires should be transposed. A diagram showing all three of the power-circuit wires and the two telephone-circuit wires, together with all of the transpositions, will indicate clearly that each telephone wire is exposed equally to all power wires and that all power wires are exposed equally to the telephone wires. This condition gives the balanced or equal exposure mentioned previously in this article.

Even after a telephone line has been well balanced with respect to exposure, resistance and insulation, cases of trouble still are bound to occur. To facilitate the locating of these cases some provision should be made for opening the line at various points without necessitating the cutting of the wires. The contacts on such a device should be firm and of large contact area and should be protected from dust and dirt. A good 2-kv. primary cut-out is very good for this purpose, but the plug must be coppered in solid with the same size and kind of wire as the line wires, with the exception that it should be soft-drawn. However, it should be unnecessary to install such cut-outs closer together than 10 miles as each one is just another weak point in the line.

Inspection of a line that has been in service for many years may show that the line wires have been repaired a number of times and that other than standard sizes of wire and splices have been used. This condition will give an unbalance due to resistance differences and may be located with a bridge or resistance meter. By shorting and grounding the line at the far end and subsequently at numerous intermediate points and in each case measuring the resistance of each wire to ground, the cause and location of the unbalance can be determined easily. When looking for

telephone line troubles it always should be remembered that the trouble may be caused from the power circuit. The power circuit itself may have a case of trouble such as loose ties, bad insulation, burnt line wires, broken bonds, or other difficulties that later may cause a failure of the power circuit and perhaps of the telephone circuit as well. Therefore, it behooves every telephone man to watch not only his telephone lines but the power lines as well. Efforts along this line will repay greatly both the telephone and the transmission departments.

To summarize in closing: a telephone line on power poles must be kept well insulated from ground; must have a balanced leakage to ground; must have a balanced exposure to the adjacent power wires; and must have a line-resistance balance. With these virtues and with eternal vigilance telephone service should be first-class even though the lines are carried on structures in common with 70-kv. lines.

Editor's Note.—This concludes the series of articles written by Mr. Kalb and dealing with some of the more important problems incident to power-company telephone lines.

Electric Shovel Quarries Rock Cheaper Than Steam

By HAZEN G. REDFERN,
Manager Dinuba District, San Joaquin Light & Power Corporation, Fresno, Calif.

An electric shovel has replaced the steam shovel at the Coast Rock and Gravel Company's quarry at Piedra, Fresno County, Calif. The new equipment has proved highly satisfactory in operation and has resulted in substantial savings in fuel and labor costs amounting to approximately \$1,500 a month. Two men are required to operate the electric giant as compared with seven and eight men on the old steam shovel.

Greater frequency in loading and speed in swinging the load enables the new shovel to handle more rock in a day than did former shovels, despite the fact that the bucket is of smaller capacity. The broad caterpillar tread, 4 x 16 ft., permits moving the machine into any position, no anchoring being required. The steam shovel traveled on

rails that required considerable labor to move. It is interesting to note that the electric shovel can be moved the full length of the quarry by the two operators in less than fifteen minutes, an operation which took an entire day with the steam equipment and required a crew of twelve men. Moving day often meant shutting down the entire plant, with idle men and machines on the payroll.

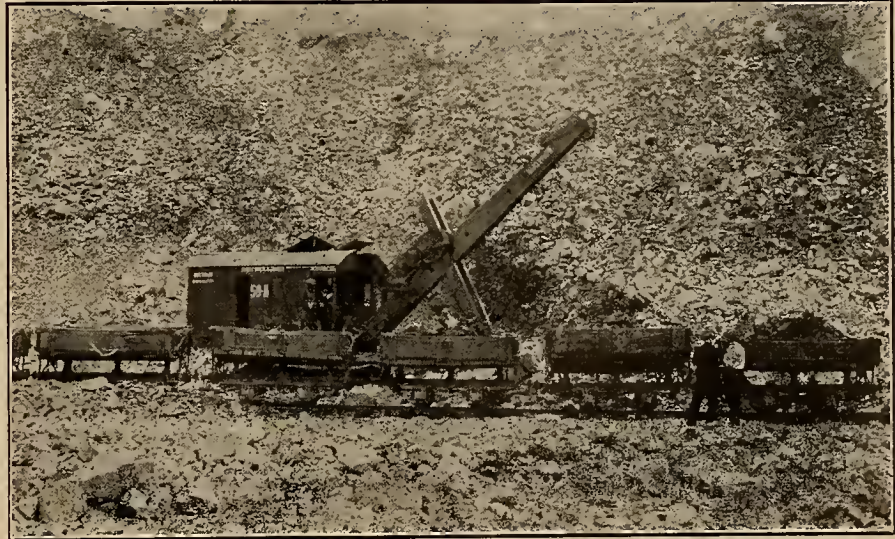
Another factor of economy is in the amount of explosive used. Formerly it was necessary to seal three or four sticks of dynamite in the rock by means of adobe mud. Now the operator swings the beam around, drills a hole in the rock, and with one-fourth of a stick obtains the same results.

Power is supplied the machine by means of a heavy and well-insulated flexible cable connected with a feeder from a substation on the hilltop. Four motors are required for the shovel, 100 hp. for hoisting and moving the machine, 40 hp. to actuate the beam vertically and 30 hp. for horizontal operation. The two air compressors are operated by a 2-hp. motor.

In addition to the shovel installation, the rock and gravel plant is completely equipped electrically with an installation of 854 hp. in motors, 490 hp. operating the six crushers, 150 hp. the bucket elevator and screen, and 100 hp. the air compressor in the plant. The balance operates the water pumps, conveyors and shaker screens. Motors of 18 hp. additional are installed in the machine shop, operating the lathe, blast drill tool dresser, and ice-making machine.

Operation of a lift bridge on the lines of the Pennsylvania Railroad Company at a point remote from transmission lines and other sources of electric power caused that company to install two 100-kw. gas-engine-generator sets for that purpose. Two 100-hp. motors are installed at the lift span. Either motor and either generator set is capable of operating the bridge. Thus the duplicate installation insures the undelayed operation of the bridge.

Shop Foreman—"Smoking, hey?"
Erring Worker—"No, Camels."



Electric shovel used in the Coast Rock and Gravel Company's quarry at Piedra. Power to operate the four motors is transmitted from the power line on the hilltop by means of a heavy flexible cable.

IDEAS FOR THE CONTRACTOR

Electrical Estimating for the Contractor—VIII
Belt and Pulley Problems with Which a Contractor in the
Power Installation Field Should Be Familiar

By J. R. WILSON,* Engineering Department, Los Angeles Electric Works

The electrical estimator who specializes on power-installation work occupies a unique position in the electrical field. Most of his prospects, particularly the one which would be termed the small-job customer, expect him to function in several capacities. They feel that he should be an electrical engineer, mechanical engineer, ventilating engineer, illumination expert and millwright.

In order to satisfy this class of customer an estimator really must be able to function to a small degree in each of the above capacities; otherwise the customer feels that the estimator does not know his business. The problems to be met in the usual small job are not of great enough magnitude to require a complete knowledge of any of the above professions. A few tables and formulas pertaining to each of these lines of endeavor are all that is necessary.

An estimator should carry these reference data with him and not attempt to memorize them. He will find that very few of these problems will offer any difficulty if he has the right data and knows where to find what he needs. In an endeavor to offer some assistance to the estimator who has not had the advantage of a diversified experience in this class of work the next few sections of this estimating series will be devoted to this type of data. Tables and formulas will be presented with examples of their practical application.

Millwright work represents the greatest number of problems met with; therefore we will consider this phase first. A fair knowledge of belts and their application must be acquired before much progress can be made in solving mill-wrighting problems.

If a belt is to transmit effective power there must be more tension in one side than in the other. The difference in tension between the two sides is called the effective tension. To determine the proper belt to use for each installation several factors must be considered. Among these are conditions of use, load belt will be expected to carry, and money available. It is very poor economy to buy a belt of too light weight or to buy a cheap grade of belt, as the deterioration will be very great.

A good belt should stand 25 per cent overload for short periods of time without ill effect. A belt larger than indicated by the apparent load is one of the best investments that can be made. The life of the installation is

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dependent upon the quality of the belt used and break-downs are the most expensive items of plant operation.

Accompanying this article is a number of rules and tables pertaining to belts, with examples of their use. Originality is not claimed for these data, but most of them have been tested in everyday use and have proved of great assistance in solving belting problems.

The first rule to be learned in laying out line shafting and belt drives is to make the distance between the shaft centers as great as possible with the space available. The effective power transmitted by a belt is represented by the arc of contact on the smaller pulley. Where the difference in size between the two pulleys is considerable the arc of contact may be very small. This will result in considerable slip, and the amount of this slip represents the power lost in transmission. The arc of contact on the smaller pulley should never be less than 155 deg. and standard practice has shown that 165 deg. as a minimum is much better.

The belt should be run as slack as possible, and arcs of contact less than those recommended above will necessitate running the belt at too high tension. The ideal horizontal drive is with the belt pull on the bottom and enough distance between shaft centers that the weight of the belt gives at least 180 deg. arc of contact on the smaller pulley.

TABLE 1
Arc of Contact on the Smaller Pulley
Dif. in diam. of pulleys in in.

R = $\frac{\text{Center distance in ft.}}{\text{Dif. in diam. of pulleys in in.}}$		
R	Arc of Contact (Deg.)	Correction Factor
0	180	1.00
1	175	.97
2	170	.95
3	165	.92
4	160	.90
5	155	.87

The distance between shaft centers that will be necessary to give a desired arc of contact can be determined by the following formula:

Divide the difference in diameter in in. of the two pulleys by the ratio R. For value of R refer to Table 1, and choose the value opposite the arc of contact desired.

$$\frac{D-d \text{ (in in.)}}{R} = \text{C.D. (in ft.)},$$

where C.D. is the shaft center distance.

After the arc of contact has been found, refer to the column which gives the amount to correct the different arcs of contact.

If the desired arc of contact requires a shaft center distance in excess of the available room, use a short center drive with one of the many belt idlers now on the market. Refer to Table 2 for list of practicable shaft center distances. Another very good formula for arc of contact is given below:

Arc of contact in degrees =
180 deg. — [60 × (D — d) ÷ L]
D = Diam. large pulley in in.
d = diam. small pulley in in.
L = Shaft center distance in ft.
Percentage of power transmitted
(based on variance from 180 deg. arc of contact on smaller pulley).

Per Cent	Deg.	Per Cent	Deg.	Per Cent	Deg.
170	97	140	87	110	75
160	94	130	83	100	70
150	91	120	79	90	65

Table 2.
Satisfactory Center Distances

Type of drive	Width of belt (in in.)	Distance between centers (in ft.)
Small C. S.	2 to 6	Approx. 10 to 12
Medium C. S.	6 to 10	Approx. 14 to 18
Large C. S.	10 and up	Approx. 18 to 25
Main	12 and up	Not over 35

C. S. = Counter Shaft.

A given belt will not transmit the amount of horsepower at which it is rated unless the type and weight are correct for that particular installation. The very best belt ever manufactured will fail if used where the conditions are not satisfactory. In order to transmit power by belting two factors are of paramount importance: pulley diameter and belt speed. Of these two factors the belt speed is of the most importance as the heating effect on the belt depends upon how many times per minute the belt is bent around the pulley. It is self-evident that a slow-speed drive will prove more satisfactory over small pulleys than the same belt run at higher speeds.

Tables 3 and 4 give the minimum diameter of pulleys to be used with the standard grades of belting marketed by reliable manufacturers. The tables take the belt speed into account.

The rim velocity of either pulley determines the belt speed in ft. per min. The formula for determining the belt speed is as follows:

Pulley diam. times 3.14 times the r.p.m. of the pulley.

If the diameter of the pulley is given in in., the answer must be divided by 12 to get the speed in ft. per min.

Example: 16 in. diam. running 250 r.p.m. What is the belt speed?

Answer:

$$\frac{16 \times 3.14 \times 250}{12} = 1046 \text{ ft. per min.}$$

We will now consider a number of rules pertaining to belting.

Rule 1

To find the right width of belt to transmit a given hp., belt being single leather or 4-ply rubber, multiply hp. to be transmitted by 33,000, divided by the product of ft. per min. times 60.

Example: Belt to transmit 100 hp. at 3,500 ft. per min. = ?

$$\frac{100 \times 33,000}{3,500 \times 60} = 15\frac{1}{4} \text{ in.}$$

For light double leather and 5-ply rubber multiply by 80 instead of 60.

Heavy double leather multiply by 100
6-ply rubber multiply by 120
3-ply leather multiply by 140
8-ply rubber multiply by 140

Rule 2

What hp. will a given belt transmit at a given speed, belt being single leather or 4-ply rubber? Multiply width of belt by 60 times ft. per min. divided by 33,000 = hp.

Example: What is the hp. of 10-in. belt at 4,000 ft. per min.?

$$\frac{10 \times 60 \times 4,000}{33,000} = 72\frac{2}{3} \text{ hp.}$$

Table 3

*Minimum Diameter of Pulleys for Leather Belts.

		Linear Velocity —Ft. per Min.			
		3000 and up			
Width	Ply	Weight	1000	2000	3000 and up
To 8	Single...	Lt.	2*	2½*	3*
		Med....	3	3½	4
		Hv....	4	5	6
To 12	Double...	Lt.	4	5	6
		Med....	8	10	12
		Hv....	10	13	14
To 24	Triple...	Hv....	24	30	36

*In inches.

Table 4

Minimum Diameter of Pulleys. Rubber Belts.

Operating Conditions.		Weight of Belt (Plies) Recommended.				
		Special	Light	Heavy	Xtra-Hv.	
Pulley Diam. (Inches)	Speed R.P.M.	Not over	Not over	Not over	Not over	
4.....	Over 2,000.....	4	3	—	—	
	Under 2,000.....	5	4	—	—	
5 to 6.....	Over 2,000.....	5	3	—	—	
	1,000 to 2,000.....	5	4	—	—	
7 to 8.....	Under 1,000.....	6	5	4	—	
	Over 1,000.....	5	4	—	—	
9 to 11.....	Over 2,000.....	5	4	—	—	
	1,000 to 2,000.....	6	4	4	—	
12 to 15.....	Under 1,000.....	7	5	4	—	
	1,500-2,000.....	7	5	4	—	
16 to 20.....	1,000-1,500.....	7	5	5	—	
	600-1,000.....	8	6	5	4	
21 to 30.....	Under 600.....	—	6	6	4	
	1,200-1,800.....	—	5	4	4	
Over 30.....	600-1,200.....	—	6	5	5	
	Under 600.....	—	6	6	6	
Any speed.....	900-1,200.....	—	7	6	5	
	Under 600.....	—	8	7	6	
Any speed.....	600-900.....	—	—	7	6	
	Under 600.....	—	—	8	7	
Any speed.....	Any speed.....	—	—	—	8	
	Any speed.....	—	—	—	—	

These figures are good standard practice.

For other weights of leather or plies of rubber use factors given in Rule 1, instead of 60.

Rule 3

To find length of belt when both pulleys are nearly same diameter, multiply one-half the sum of both diameters by 3.14 plus twice the distance between shaft centers.

$$\begin{aligned} & \frac{D + d}{2} \times 3.14 + 2 \text{ C. D.} \\ & = \text{Length of belt.} \end{aligned}$$

Example: Open drive 24-in. pulley to 18-in. pulley. 15 ft. between shaft centers.

$$\frac{24 + 18}{2} \times 3.14 = 66$$

$$15 \times 12 \times 2 = 360$$

$$\text{Length of belt} = \frac{66 + 360}{12}$$

$$= 35 \text{ ft., 6 in.}$$

To find length of belt when pulleys are quite different in diameter, add the following three factors:

A = Multiply ½ sum of diameters by 3.14.

B = Multiply distance between centers by two.

C = Square difference in diameters of pulleys and divide by 4 times distance between centers.

Example: Open drive 72-in. pulley to 24-in. pulley. 20 ft. distance between shaft centers.

$$A = \frac{72 + 24}{2} \times 3.14 = 151$$

$$B = 20 \times 12 \times 2 = 480$$

$$C = \frac{72 - 24}{4 \times 240} = \frac{2304}{960} = 2\frac{1}{2}$$

$$\text{Length of belt} = \frac{151 + 480 + 2\frac{1}{2}}{12}$$

$$= 52 \text{ ft., 9½ in.}$$

Length of belt for crossed belt drive. Add the factors A and B.

A.—Multiply ½ the sum of the pulley diameters by 3.14.

B.—Square ½ the sum of the pulley diameters and add the square of the distance between shaft centers. Extract the square root and multiply by 2.

Example: Crossed belt drive 14-in. pulley to 16-in. pulley. 12 ft., distance between shaft centers.

$$A = \frac{14 + 16}{2} \times 3.14 = 47.1$$

$$B = 2\sqrt{\left(\frac{14 + 16}{2}\right)^2 \times (12 \times 12)^2}$$
$$= 289.4$$

$$\text{Length of belt} = \frac{47.1 + 289.4}{12}$$

$$= 28 \text{ ft., ½ in.}$$

The above rules are applicable to horizontal drives without the use of correction factors. In vertical drives another factor must be taken into account in order to design drives that will prove satisfactory. This factor is the tendency of the belt to stretch under load and fall away from the lower pulley. This will affect the arc of contact in proportion to the size of the lower pulley and may amount to a reduction of one-half of the belt capacity. If this factor is lost sight of in vertical drive it will be the cause of a very unsatisfactory drive.

A liberal allowance always should be made in belt size to counteract the effect of this factor. When worked vertically, wide thin belts will prove the most satisfactory. A good rule given by one of the leading belt manufacturers is to allow one per cent deduction in belt rating for each degree of angle over 40 deg. This is shown more clearly in Table 5.

Table 5

Deductions to make for angle of drive:

Angle drive makes with horizontal deg.	Deduct from belt ratings per cent
40	0
50	10
60	20
70	30
80	40
90	50

Sign Designed for Barber Shop to Indicate Vacant Chairs

The Exchange Barber Shop, located in the Builders Exchange building in Oakland, Calif., has an unusual sign installed in the members' room of the exchange that indicates what chairs in the shop are vacant at any particular time.

This prevents any humiliation or embarrassment which might arise when a customer has a favorite barber and one of the other chairs is vacant. It is not necessary for the members to look inside of the shop, as the sign indicates when the barber they prefer is not busy.

A switch near each chair controls the lamps in the sign for each barber. There are four lamps in the top part of the sign for general illumination of the barber shop sign. The sign was manufactured by the Imp Sign Company, Oakland, and was installed by the Spencer Electric Company of that city.



This sign above the door in the members' room in the Builders Exchange, Oakland, Calif., indicates what chairs in the adjoining barber shop are vacant at any particular time.

Furniture Building Has Large Electrical Installation

The building constructed for Barker Brothers Furniture Company in Los Angeles contains an unusually fine electrical installation. Each ceiling outlet has a capacity of 1,000 watts and is on a separate circuit. Each of the base plugs throughout the building also is on a separate circuit.

There are 216 circuits for window lighting and a total of 444 circuits is installed on the first floor. A total of 2,500 lighting circuits has been provided for and 2,445 of these are connected at present; the connected lighting load amounts to 9,300 amp. A total of 750 hp. is connected.

The accompanying pictures present some of the outstanding features of

interest from the viewpoint of the electrical engineer or contractor. Fig. 1 shows a number of conduit runs suspended from the ceiling. There are 42 conduits ranging in size from 1½ in. to 3 in. suspended in this manner. No conduit smaller than ¾ in. was used in the job. Fig. 2 shows the rear view of the main switchboard. It may be noted that no wires are exposed; all wires were brought to the pullbox above and below and then sweated into lugs. This board was manufactured by Brown & Pengilly of Los Angeles. Fig. 3 is a front view of the board, which is 23 ft. long and 10 ft. high. There are three rows of switches on the board as may be seen. The manner in which the conduit runs branch at the ceiling is particularly noteworthy.

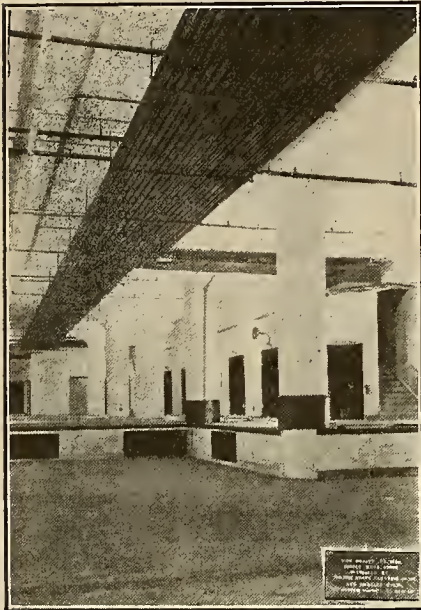


Fig. 1.—A practical method of suspending conduit runs from the ceiling.

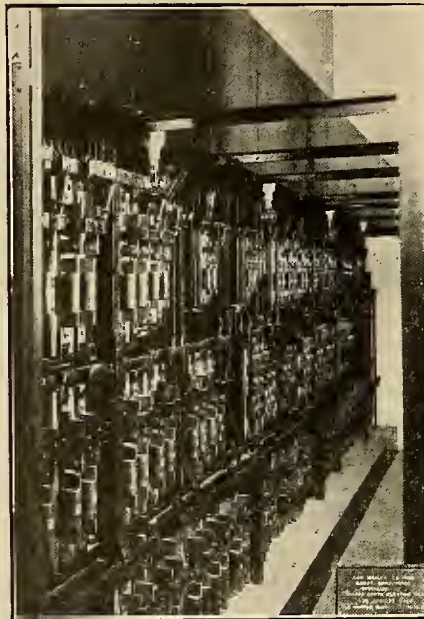


Fig. 2.—Rear view of the main switchboard. Note that there are no exposed wires.

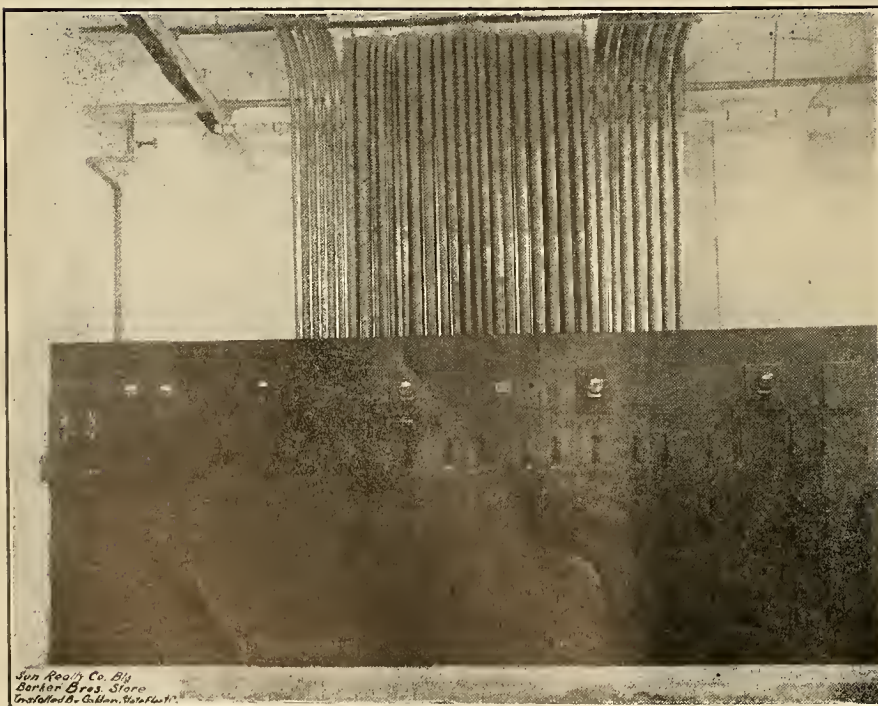


Fig. 3.—Front view of the main switchboard showing the three rows of switches. Notice the manner in which the conduit runs branch at the ceiling.

Other material used included: 136,000 ft. or 25½ miles of conduit; 550,000 ft. or 102 miles of wire; 470 lb. of solder; and 500 lb. of tape.

The electrical installation was made by the Golden State Electric Company of Los Angeles. Labor equivalent to the efforts of one man working continuously for 16 years was required in completing this work.

Questions and Answers on the Code and Safety Orders

Arrangements have been made with Claude W. Mitchell, electrical engineer of the Board of Fire Underwriters of the Pacific, to answer through the columns of the Journal of Electricity such questions on the National Electrical Code as are of general interest.

Similar arrangements have been made with George E. Kimball, electrical engineer of the Industrial Accident Commission of the State of California, to answer questions on the Electrical Safety Orders issued by the Commission.

While it is the object of this department to assist in a better understanding of the Code and the Safety Orders, replies given are not to be considered as official interpretations applying in all instances, as some of the rules permit of varying interpretations under different conditions. The questioner should be guided by the inspection department having jurisdiction.

All who are interested are invited to send in their inquiries regarding the National Electrical Code to Claude W. Mitchell, Board of Fire Underwriters of the Pacific, Merchants Exchange Building, San Francisco, Calif., or to the Editor, Journal of Electricity, 883 Mission Street, San Francisco. Questions on the Safety Orders should be sent to George E. Kimball, Industrial Accident Commission, State Building, Civic Center, San Francisco, or to the Editor.

Q. 5. May the frames of portable heaters be grounded by connecting the frame to the grounded neutral?

A. No. A 3-wire cord is required with three-conductor plugs and receptacles. See Order 702-1(x). The conductor attached to the frame for grounding must be connected through the plugging receptacle to a grounding conductor. In a conduit system this grounding conductor at the receptacle may be attached, in an approved manner, to the grounded conduit but not to the grounded neutral.

Q. 6. May more than nine wires be installed in one conduit?

A. Usually nine wires are the limit, except in cases where there are short straight runs or special installations where special permission is granted by the inspection department having jurisdiction. See Orders 703-3(c) and the second paragraph of Order 703-3(a). Exceptions also are made for certain wiring in theaters, on signs and in other locations.

Electrical Men Assist in Proper Kitchen Layout.—Electrical men in Seattle, Wash., co-operated with the Seattle Post-Intelligencer's women's department in a "Dream Kitchen" contest, in which prizes totaling \$85 were given for the best plan for a modern kitchen. J. J. Agutter, electrical engineer, gave his idea of the proper arrangement of lights and the number of convenience outlets required to make a kitchen 100 per cent in convenience and efficiency.

Floodlighting Installation Sold to Denver High School

What is described as being the best addition to the civic beauty of Denver, Colo., in recent years is the effect produced by the floodlighting of the new East Denver High School. This is the first attempt to floodlight a public structure in Denver, and the favorable comment heard from every group throughout the city augurs well for similar activity in connection with the construction of a new five-million-dollar municipal building.



Denver High School floodlighted by means of a temporary installation used in selling a permanent job to the school board.

To the staff of the Electrical League of Colorado credit is due for the development of the floodlighting idea in Denver. In the case of the new high school it was the league staff which suggested the experimental arrangements and supervised the temporary installation illustrated in the accompanying photograph.

Although the school board has not given its final and official approval to the permanent floodlighting scheme, the weight of public sentiment is so strong that it is considered only a matter of formality. The location of the building not only permits but demands, it is said, an outside lighting scheme. It is located on the esplanade leading to the city's principal park and is at the head of one of the main residential thoroughfares. In the summer it is one of the show places for tourists, especially on the twilight tours of the city. The architecture lends itself to a decorative lighting scheme, and the presence of a large clock in the tower makes night lighting highly desirable.

This new high school has been occupied only five months, and during the period of construction no outside lighting arrangements were permitted consideration. With no facilities having been provided in the design of the building, the floodlighting scheme is one which has proved mainly dependent on finding means and methods of installing the 500-watt floodlighting units used.

Advanced Apprentice School Starts in San Francisco

An advanced school for apprentices has been opened by the Industrial Association of San Francisco, with 20 boys enrolled for instruction. The class meets one night each week at 1120 Howard Street, and the instruction does not cost the boys anything as all the expense is borne by the Industrial Association.

The class is conducted along the lines of the beginners' apprenticeship school, details of which were given on page 60 of the Jan. 15 issue of the Journal of Electricity. It is probable that another beginners' class will be started in the near future as a number of applications have been received from boys who cannot be accommodated in the present class.

Municipal and Civic Headquarters Entirely Electrical

The City Hall building in Lemoore, Calif., which houses the municipal offices, the fire department and the Chamber of Commerce, and contains public rest rooms as well, is heated throughout with electric air heaters. Majestic air heaters having a total capacity of thirty-seven kw. are installed.

The city council chamber can be converted into a banquet hall capable of seating 200 people. Adjoining this is an electric kitchen equipped with a seven-kw. Hotpoint automatic range and a seven and one-half kw. electric water heater.

The fire department headquarters include a large club room and bath and shower room, in addition to the engine house and dormitory. Automatic switches turn on the lights in the engine house and dormitory when an alarm comes in.

George M. Rankin of the California Electrical Bureau was primarily responsible for selling the idea of installing electric air heating in the building. The electrical installation was made by the Lowe Electric Shop, electricists of Lemoore.



Fire-department club room in the City Hall Building, Lemoore, Calif.

Irrigation District Will Not Inspect Private Wiring

The Modesto Irrigation District will not inspect private wiring, according to a decision reached at a recent meeting of the board of directors. This decision was reached after employees of the district had stated that improper wiring had been responsible for several fires in rural homes. It was said that the wiring in many instances was installed by the owners or others who were not qualified to put in a safe installation. The fear was expressed that the district would be liable in case one of its employees was appointed as an electrical inspector.

There was some talk of urging the county supervisors to adopt an ordinance establishing an inspection service and a standard of wiring.

The failure of the board to appoint an inspector probably will result in the appointment of an inspector by insurance companies. The insurance companies will inspect all present wiring where insurance is carried and will instruct owners to have such repairs or rewiring done as is deemed necessary. If the rewiring is not done within the time specified, insurance will be cancelled. Those who do not carry fire insurance will not receive the benefit of the inspection service.

One From Eidlitz.—Charles M. Eidlitz, chairman of the New York Electrical Board of Trade, has had a motto for thirty years, "Folks who never do any more than they get paid for never get paid for any more than they do."

The Amann Electric Works have moved from their old location at Pico and San Pedro streets, Los Angeles, to a new store at 3703 S. Park Avenue. Since the firm specializes in motor repair sales and installations, its new location will be more advantageous as it is in an industrial district.

Cheap Price Not Necessary

Records of great merchandising establishments selling gas ranges also reveal that the lowest-priced range isn't the biggest seller by any means. Naturally, in electric range sales there has been a consistent effort to bring electric ranges down to such a price level as to make them available to the average home. That price level has been achieved, and electric-range prices compare favorably with gas-range or other stove prices.

It is estimated that the average of all prices for gas ranges is \$74.49, but that the average of ranges sold sell for \$96. This is a significant fact to the merchandiser of electric ranges and should go far to dispel the idea that people do not buy expensive ranges.

Why Women Buy Electric Ranges

What qualities does a woman demand of a range? What motives may be created which will result in the sale of an electric range to the housekeeper of the modern home? These are considerations it would be well to look into, for it is upon these factors that sales most easily may be fostered.

E. A. Norton, of Barker Brothers, Los Angeles, at a recent electric range committee meeting set forth the following cardinal sales principles. These are the reasons women buy gas ranges. They are also better reasons why women will buy electric ranges.

1. **TRADE-IN** of an old range is a big item in making sales. Whether the amount allowed for the old cook stove is large or small, the fact that the purchaser gets something for it, that it doesn't have to be junked or that tiresome bickering with secondhand dealers will not be required, is enough to push over many a sale where every other factor is assured.

2. **EASY TERMS** in this day and age have universal appeal. It is much easier to buy an article that is sold at \$5 down. All the customer looks at is the down payment, and his impression of the magnitude of the total price of the range is lost if the start can be made easy.

3. **PROPER PRICING** is important. Not that it is necessary to make the price low, for expensive ranges are being sold as often as cheaper ones, but the price should be made to seem attractive.

4. **"HOW WILL IT LOOK?"** Women today are interested in the interior decoration of their homes. They are being educated by magazines, by example, and by general tendencies to make the home an attractive place. And the kitchen is being made the most attractive spot in the modern home. So women demand a range that looks well, that they may be proud to possess. There are two things a woman asks of a range. The first is, "How will it look?" and the second is—

5. **"HOW WILL IT COOK?"** Electric cooking has so many advantages in its favor that many a sale is made on this point alone. The preservation of the natural juices of meats and vegetables cooked in an electric oven, the perfect regulation possible, and other features of electric cookery are invincible arguments.

6. **CONVENIENCE** is a big item. The automatic features of an electric range promise freedom for the housewife from the slavery of a kitchen. The cleanliness of the electric range, the fact that it takes so little fussing around to operate successfully, the perfect regulation afforded by it, all spell a consideration for the woman's domestic problems that she appreciates and desires.

7. **IDENTIFY** the piece of merchandise you sell with the good name of your company. That gives the purchaser confidence in it from the start. She doesn't feel that it is an untried thing. Make her feel that if anything should go wrong, or if she should have any difficulty in learning to use it, you would straighten it all out. There's comfort in that thought. Foster it.

Oakland, Cal., Has Largest Cooking School in State

Prizes Given for Cakes, Pies; Nursery for Children and Foodstuff Dealers' Co-operation Feature Event

The free electric cooking school held in Oakland, Calif., by the Oakland Tribune is said to have been the largest one conducted in the state up to that time. The course was given in the Oakland Municipal Auditorium Theater from two to four in the afternoons of four successive days, from Tuesday to Friday, Jan. 19-22, 1926.

The sessions of the school included complete demonstrations of the preparation, cooking and serving of staple foods, desserts, meats, fish, poultry, and complete meals. Clear and accurate explanations of the processes were given by Miss B. E. Galvin and Miss L. Carol Dangler, home economists for the Edison Electric Appliance Company.

The last day of the school was featured by a baking contest divided into cake and pie divisions. The 1,000 entries received were baked in the homes of the contestants on any kind of range. The ingredients used had to be those advertised in connection with the school. After the contest the entries were turned over to the Salvation Army Rescue and Maternity Home to sell and the \$400 received therefrom was devoted to the needs of the Home.

Prizes aggregating \$1,000 were given away in this contest, there being twelve prizes in each of the two

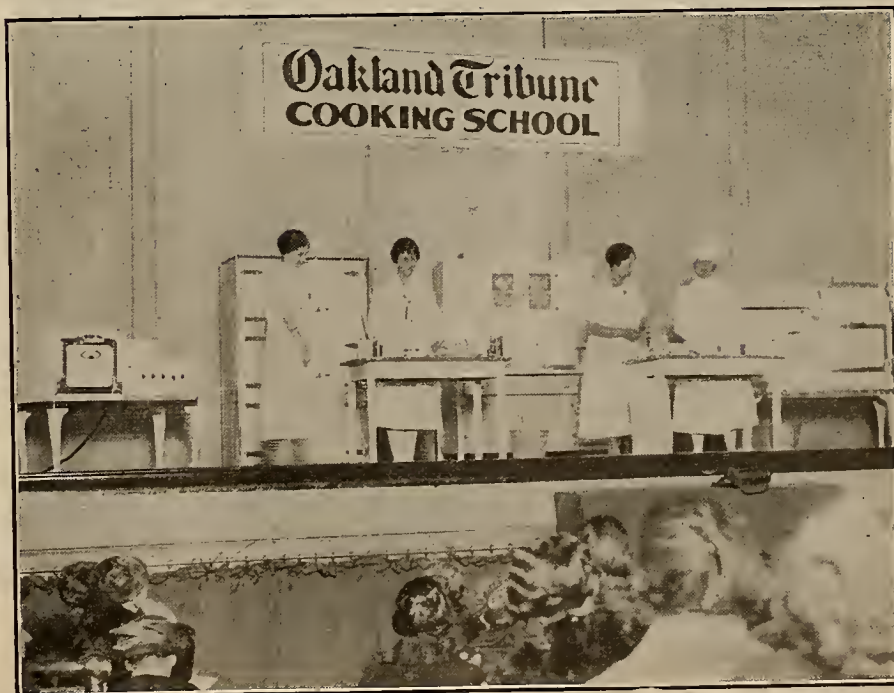
divisions. The first prize in the cake division was a super-automatic Hot-point electric range and the second prize was a Thor folding electric ironer. The first prize in the pie division was a Maytag electric washer; and the second prize a Check Seal electric vacuum cleaner. In addition to the prospect of winning a prize, every entrant in the contest received a one-pound can of Crisco.

During the time the school was held all of the prizes were displayed in the lobby of the theater. In addition to the prizes, a number of electrical appliances were on display in show cases.

Three question boxes were located at convenient places in the auditorium so that those in attendance might submit their cooking problems to the home economists for solution. These questions were answered from the stage each day.

One of the unusual features of the school was a nursery with a competent nurse in charge to provide for the little children who could not be left at home. By this means a great many mothers who might otherwise have had to stay at home were able to attend the school.

During the week two radio talks were given over KLX. On the Monday night previous to the opening of the



The stage of the auditorium was used as a demonstration kitchen for the largest electric cooking school held in California, conducted in Oakland recently.

school Miss Galvin gave a talk on the progress of cooking. Miss Dangler talked Wednesday night on the modern home in which she told how a woman equips her workshop and the particular work preformed by each electrical appliance in the home.

Prior to the school the Pacific Gas and Electric Company and the Great Western Power Company sent invitations to their residence consumers in Oakland to attend the school. The Pacific States Electric Company sent an announcement relative to the school to its dealers and urged them to take advantage of the opportunity to the fullest extent. The Globe Mills sent announcements to a number of grocery stores urging them to tie in with the school. Announcements concerning it were made in the city schools, the Parent-Teachers Association and the Nurses' Association.

During the week following the Tribune Cooking School, schools were conducted in the Pacific Gas and Electric Company auditorium and at Breuner's in Oakland. The Thomas Day Company had a demonstrator in its window. Window displays were made in the windows of the Great Western Power Company, Capwell's, Sperry Electric Homes, Breuner's and the Pacific Gas and Electric Company.

Let Them Guess Cost of Complete Electrically Cooked Meal

A notion still prevails in some quarters, along with others of the same character and up-to-dateness, that just because a meal is cooked on an electric range it must cost a young fortune. And while to the electrical industry that idea has been relegated to the realms of myths the notion still keeps many otherwise good prospects from being at all interested in electric cooking.

To dispel this archaic idea, one live merchandiser, J. C. Hobrecht of Sacra-

mento, Calif., decided upon a plan which should be useful to many other range dealers. He decided that to "debunk" the "high-cost-of-electric-cooking" idea he would institute a contest in which the one who guessed nearest the cost of cooking a complete meal would receive a prize.

The guesses made proved exactly what was expected. They ran all the way from 3 cents to 35 cents, all of them wrong. On the specified day for the close of the contest the complete meal was cooked, and the wattage figured up. And the actual cost of the meal in electrical energy was found to be less than 2 cents, .0192 to be exact.

A revelation to those who took part in the contest, this method of bringing the matter forcibly to their attention succeeded in making prospects of a large percentage of them and customers of many of the prospects. Makes Store a Range Headquarters

Mr. Hobrecht also has discovered another interesting phase of range-sales psychology. Sometime ago he decided that he would carry also a complete line of gas ranges since the territory in which his store is located is served economically with that fuel.

"I find," said Mr. Hobrecht, "that the presence of a complete line of gas ranges helps me immensely in my electric-range sales. You might not think so at first glance, but the fact that we have all kinds of ranges has established our store as a complete stove store, a range headquarters.

"So when people here think of ranges they think of this store. As a result many a customer who has come in to look at gas ranges has seen the electric ranges on the same floor, and with the advantages of the electric range pointed out to her has bought the electric range rather than the gas range. Every range-buyer is told of the advantages of the electric

range, and I believe we get more range prospects by this method because we get both the gas and the electric-range prospects."

San Joaquin Offers Employees Sales Courses at Cost

Courses in lighting sales, merchandise sales, and power sales are being offered the employees of the San Joaquin Light & Power Corporation, Fresno, Calif., according to a recent announcement in the company magazine. The courses offered are proffered to employees upon an easy-payment basis and at reduced cost.

The courses chosen by the educational committee are those prepared by the National Electric Light Association. The company is to assume the cost of the courses, reimbursing itself for them by deductions from the monthly payroll of those employees taking advantage of them. The company pays one-half of the cost of the course itself, however, giving the employee the course at half cost.

In addition to this, the course of instruction given by the company to its employees last spring is to be repeated for the benefit of those who did not take advantage of the previous opportunity. This course is to be given free. It covers the history, organization and operation of the company system as well as elementary instruction in electricity, the financial structure of the company and outlines of departmental work.

Six N. E. L. A. courses also are offered for those interested in accounting, engineering and operating branches of the industry. The commercial courses are those on lighting sales, merchandising sales, and power sales. Classes are to be maintained, with class leaders arranged for

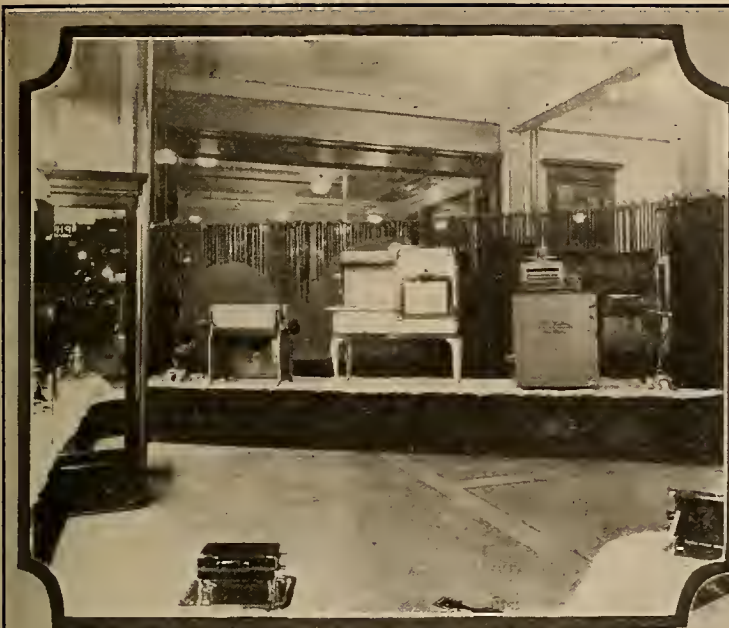
Department Store Holds Electric Appliance Exposition

Several hundred feet of floor space recently were devoted by the electrical department of Holzwasser's Department Store, San Diego, to what was termed "San Diego's first electrical exposition. Timed to include the busy Christmas shopping season, the exposition was visited by many thousand people, the majority of whom were interested housewives, the best potential customers.

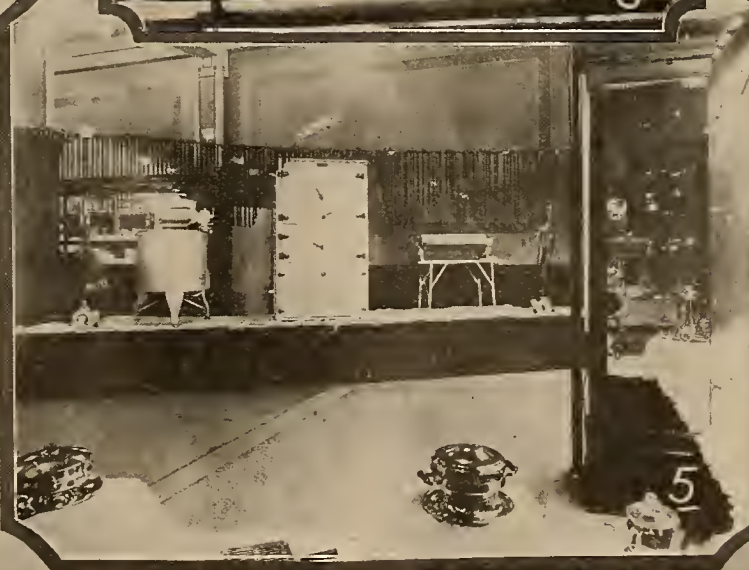
Quarter-page advertisements were run daily for a week or so preceding the exposition, announcing various features. One advertisement read, "Everything possible has been done to make this exposition of immense educational value to the women who seek to modernize their homes. The newest designs in household labor-saving devices of the foremost standard manufacturers will be on exhibition. You will see the very newest types of washing machines, including Thor cylindrical type, the Easy vacuum cup, the Sunbeam oscillator and the new Gain-a-Day. Then you will see the Eureka, Premier Duplex, Cadillac, Liberty and Perfection vacuum cleaners, in addition to hundreds of other smaller electrical household appliances." One of the biggest drawing cards was the announcement that free waffles and coffee were to be served all day long throughout the exposition.



Check your children here. Where the mothers parked their children during their attendance at the school sessions. A veritable day nursery was conducted to keep the children happy while mother learned to bake and cook the electrical way.



ONE of the most active merchandisers among central stations is the Montana Power Company, Butte, Mont. At the Christmas season its activity was extensive. These photographs show the attractive office dress and window displays used by that company last Christmas. (1) A view through one of the large windows. Both the small strip at the window and the special display set further back are visible. (2) The small appliance display down the center of the business office. (3) The outside was decorated by two large Christmas trees, illuminated by streamers of colored lamps. (4) Another view of the small appliance display in the center of the office. (5) Another of the large appliance displays, seen through the windows but available from the floor of the office for closer inspection by customers. Throughout the offices Christmas decorations were used profusely.



NEWS OF THE INDUSTRY

High-Tension Underground Lines a Coming Necessity

Continued expansion of metropolitan load centers and the continued growth in power demand even in many sections which otherwise show no particular signs of growth are causing problems increasingly difficult of solution to electric utilities. From year to year it is becoming harder to get power in sufficient quantities to strategic distribution points.

Attempts have been made and are being made to satisfy this condition through underground transmission of power at comparatively low voltages. However, G. M. Gest, underground electrical constructor of national repute, states that the ultimate solution lies only in the more general adoption of underground construction for voltages as high as 80 kv. to ground. According to Mr. Gest, present developments in cable design and manufacture fully warrant this step wherein high-tension power may be brought easily into the hearts of metropolitan load centers.

Two Japanese Power Companies Plan Power Developments

Two Japanese power companies are planning additions to their systems, according to Denkinotomo. The Tokyo Electric Light Company has been granted permission to construct a steam plant at Tsurumi near Tokyo. Four turbo-generators of 35,000-kw. capacity each are to be installed. The company already has purchased a 25-acre site for the plant, which is expected to be completed before the close of 1927.

The Daido Electric Power Company has under way plans for a power development project at Nishikizu where by the construction of a dam 100,000 kw. of electrical energy will be available.

Consolidation of Power Companies Effective as of Feb. 1

The arrangement for the consolidation of The California Oregon Power Company with the California Power Corporation, the latter company being controlled by H. M. Byllesby & Company, has become effective, and the exchange of the stock owned by the stockholders of The California Oregon Power Company for the securities of the new company has been made as of Feb. 1.

There has been no change in the corporate structure of The California Oregon Power Company and no change in its operating personnel. Paul B. McKee, vice-president and general manager of The California Oregon Power Company, together with the other members of the organization, who have been associated with him

in the past successful operation of The California Oregon Power Company, will continue in the same capacity. J. D. Grant and John D. McKee have resigned as chairman of the board and president, respectively, but will continue as members of the board of directors. J. J. O'Brien, president of H. M. Byllesby & Company, has been elected president of The California Oregon Power Company.

Other officers are: P. O. Crawford, vice-president and chief engineer; W. M. Shepard, vice-president and general agent; H. H. Jones, vice-president; R. G. Hunt, vice-president; Darwin G. Tyree, secretary; H. L. Bromley, W. G. Drew, William G. Pohl, C. H. O'Reilly, and P. A. Seitz, assistant secretaries. The board of directors consists of: Halford Erickson, R. J. Graf, J. D. Grant, R. G. Hunt, H. L. Jackman, H. H. Jones, Samuel Kahn, J. J. O'Brien, John D. McKee, Paul B. McKee, and George N. Rooker.

Los Angeles Light Bureau to Continue 3-Year Program

Gross revenues amounting to \$10,600,000 were returned by the Bureau of Power and Light of Los Angeles, Calif., during 1925, according to a report made public by E. F. Scattergood, chief electrical engineer. Expenditures amounting to more than \$7,700,000 were made on extensions and betterments. Mr. Scattergood pointed out that this was all a part of a three-year construction program laid out in 1924 at the time of the voting of the \$16,000,000 power-bond issue. The report shows that new power and light consumers to the number of more than 15,000 were added to the lines in 1925.

It is estimated that \$5,000,000 will be expended on the three-year program during 1926. Much of this sum will be used in providing additional substations. Nine substations were built during 1925 by the bureau. In addition to this building program, a stand-by steam plant and transmission line from it are to be built near Seal Beach, it was announced recently.

San Francisco Office of Geological Survey in New Quarters.—Effective Jan. 1, the San Francisco office of the Water Resources Branch, U. S. Geological Survey, Department of the Interior, has been moved to Rooms 302-305 U. S. Custom House, and combined with the distribution office. A supply of all geological survey publications, available for free distribution, is kept in stock and may be obtained at the office or requested by mail. Unpublished stream-flow records of the Geological Survey are available for use at this office, or blueprints will be mailed upon request. The library, which contains much valuable data, is maintained for the use of the public. H. D. McLaughlin is district engineer.

Wetherill Medal Awarded for Fynn-Weichsel Motor

The Wagner Electric Company of St. Louis has been awarded the John Price Wetherill Medal by the Franklin Institute, "with special mention of Val. A. Fynn and Hans Weichsel, in consideration of the progress in the electric art which this invention marks and of the development of a motor of excellent design and construction."

The Franklin Institute, with headquarters in Philadelphia, is one of the oldest scientific societies in America. The Fynn-Weichsel motor is described by the committee on science and the arts of the Franklin Institute as being a "synchronous-induction motor, either two or three-phase, having an automatic self-generated direct current to obtain the synchronous speed but with characteristics quite different from the ordinary synchronous motor. It may be used to produce mechanical power at unity power factor, or it may produce power and also raise the power factor of other motors in the same installation."

Damage Slight in Explosion at Los Angeles Main Station

An unsuccessful attempt on the part of a laborer for the Bureau of Power and Light of Los Angeles to throw a guy wire over a transmission line Jan. 18 caused a violent explosion at the main receiving station of the bureau and temporarily threw a large portion of the system out of service. The heavy load which the short threw on the substations from which the line was feeding caused an explosion in the substation which hurled a couple of skylights into the air that in turn destroyed some aerial work on the roof.

According to C. A. Heinze, superintendent of distribution for the bureau, the explosion was caused by the ignition of oil vapor which had formed due to the heavy duty on the oil switches during the trouble. No one was injured and the property damage was very slight.

Application Filed for Power Development in Trinity County, Calif.—J. B. Knight, Fred M. Kay, J. L. Stone, W. H. Haw, Frank Breeden, and David Wilson, have applied to the Federal Power Commission for a preliminary permit for a power development in New River, in Trinity County, Calif. A 50-ft. dam, having a crest 250 ft. in length, would divert water from the river through a conduit about 12 miles in length to a power house to be built near the mouth of the river and to have an installed capacity of 5,000 hp. The developed power would be used in lumbering and mining operations.

Colorado Problems Discussed at Warm Meeting of Commonwealth Club

The several and variant aspects of the Colorado River situation, presented by leaders in the respective phases of that situation and augmented by discussion by well known engineers following the papers, lent to the Feb. 18 meeting of the Commonwealth Club of California, San Francisco, something of an echo of the controversy going on in Washington over the same situation.

The principal speakers were: Burdette Moody, business agent, City of Los Angeles Bureau of Power and Light and secretary of the Boulder Dam Association; J. C. Allison, Calexico, Calif., for seven years chief engineer of the California Development Company, and active in Imperial Valley development in Mexico and United States since 1903; M. J. Dowd, superintendent of the Imperial Valley Irrigation District, and George L. Hoxie, consulting engineer, Los Angeles, representing R. H. Ballard, vice-president and general manager, Southern California Edison Company.

Following the papers five-minute discussions of the subject were engaged in by Arthur P. Davis, formerly chief of the Reclamation Service and now general manager East Bay Municipal Utility District, Oakland; John D. Galloway, consulting engineer, San Francisco; Chester Rowell, publicist and former member of the California State Railroad Commission, and others.

Burdette Moody urged support of the Swing-Johnson Bill in its modified form as recommended by Hubert Work, Secretary of the Interior and outlined Los Angeles' need for water and power. He stated that by the time Boulder Dam can be built Los Angeles can use its entire output of electrical energy and 15,000 sec.-ft. of water for domestic purposes.

J. C. Allison presented the rights of American land-owners of Mexican lands in the Imperial Valley and dismissed all other propositions as obstacles to the real need, that for flood control. He outlined the origin of the demand for the All-American canal and charged that it would be prohibitive in cost to build and to maintain, except at government expense.

M. J. Dowd, presenting the Imperial Valley irrigationists' side, also drew a picture of the danger from flood in which the valley stood, and advocated the building of Boulder Dam because, as a combined power and flood-control project, it could be made to pay for itself from power sales. He made an impassioned, extemporaneous talk, making much of the fact that although it has only about a third as much land under irrigation as has the American side of the Imperial Valley, Mexico can and does claim half the water from the present canal. He also showed that present flow of water at dry seasons is not sufficient to serve all demands.

Reading Mr. Ballard's paper, George L. Hoxie described the Edison company's surveys and power-right filings on the Colorado, and stated that had these been allowed to proceed accord-

ing to the provisions of the Federal Water Power Act power would have been delivered from the Colorado three years ago, flood control would have been provided automatically, and water for irrigation purposes plentiful. "Since then so many politicians have been elected to office on Colorado-River issues that one wonders if they really want to see the question settled. The project has evolved from the realm of economics and engineering to one of political excitement," the paper stated. Going on to show that steam generation of energy was now as cheap as water power, Mr. Ballard's paper outlined the Edison company's balanced program of development and showed that southern California has no need to fear power shortage even if the Colorado River is not developed immediately. "If the question were in the hands of business men," Mr. Ballard's paper stated, "I believe that a business-like solution of it could be made, satisfactory to all of the contesting parties. But the politicians have made a beautiful mess of the whole situation and we ought to insist that the politicians settle it." He added the suggestion that an amendment to the Work proposal for an immediate flood-control dam at Mohave site be made, while Boulder was being built.

Arthur P. Davis, in the discussion period following the papers, championed the Swing-Johnson Bill and Boulder dam, maintaining that the All-American canal was declared impractical under his administration only because storage had not then been contemplated.

John D. Galloway threw a carefully prepared bombshell into the meeting in the way of a paper deploring the Swing-Johnson Bill and government financing and operation of a big project on the Colorado for what he said was the benefit of Los Angeles Bureau of Power and Light. Beginning dramatically, "A curse of politics has fallen upon the Colorado River seven times worse than the curse upon Egypt," Mr. Galloway went on to denounce the Boulder Dam project as a raid on the U. S. Treasury, and to deplore the fact that the United States in this project was abandoning its attitude of impartial arbiter to break faith with its own people in invalidating the Water Power Act. "The All-American canal would never have been heard of if the international boundary had been thirty miles farther south," said Mr. Galloway, preliminary to showing that Mexico enjoyed rights which only international treaties could alter.

Chester Rowell, called upon to speak, merely referred to the latest reservations insisted upon by Secretary Work in respect to the project, and Mr. Davis was given further time to speak of the flood danger in Imperial Valley. Mr. Davis closed the meeting with an urgent plea for quick action "for if Boulder Dam is not built quickly the time is not far distant when it will not be needed," he said, implying that Imperial Valley would be flooded and ruined.

Experimental Arch Dam Being Built on Stevenson Creek

Work has started at the site on Stevenson Creek, Calif., selected for the experimental dam that is being built by Engineering Foundation's committee on arch-dam investigation. By the middle of February excavation for the foundation had been completed and all materials for building this structure were on the ground. The committee meantime had been completing plans for the devices and methods to be used in measurements and tests.

All essential measurements are to be made by at least two independent methods. These will have three objectives, namely, the measurement of (1) deflection of the structure, (2) deformation (as an index to the internal stresses), and (3) temperature.

For deflection measurements five steel towers, 5 ft. square and extending to the full height of the dam, are to be located on the downstream side. These towers will be enclosed in wooden sheathing to protect them from wind and unequal temperature stresses and means will be provided for checking the vertical alignment. The towers will be located at the center and at 20 and 40 ft. on either side.

At 5-ft. vertical intervals Invar distance pieces will extend from each tower to the dam whereby the variations in this distance or, in other words, the deflection can be measured by electrical means at a central point remote from the structure. This electrical device consists of a coil of high-resistance wire mounted upon an insulating core and a sliding contact, the ratio of the electrical resistance bearing a direct relation to the movement in the bar.

To check deflection measurements a specially designed clinometer will be used to measure variations in deflection between reference points that are likewise spaced at 5-ft. vertical intervals. This device consists essentially of a vertical shaft affording a sensitive level bubble (about $4\frac{1}{2}$ sec. of arc) brought to a truly vertical position by a standard Starret micrometer head. A third deflection measurement will be made with the use of theodolites by which intersections will be secured on a number of points at the base and crest of the dam.

Deformation is to be measured by 150 electric telemeters buried in the concrete of the structure. These telemeters developed and calibrated by the United States Bureau of Standards depend on the principle that a stack of thin carbon disks has an electrical resistance, which changes with pressure variation. The amount of this resistance, therefore, measured in a remote central location in the dam will give an index of the strain in the concrete at the telemeter location.

The check method for measuring strains will use a specially designed strain gage whereby the deformation of a large number of octagon figures on the downstream surface of the dam will be observed. In general these octagon figures will be located at 10-ft. intervals horizontally and vertically

and will be supplemented by corresponding measurements on the upstream face of the dam when the water is low enough to make such measurements practicable.

Temperature measurements are to be made with a coil of wire which will provide an electrical index of the temperature at each telemeter location. As a check, direct readings of temperature will be taken on thermometers inserted in holes to be left in the concrete for that purpose.

Special care is being taken to secure uniformity of concrete, both in regard to the various sizes of aggregate used and in uniformity of water-cement ratio as well as in observing absolute uniformity as to the time used in mixing the various batches. In addition to specimens made to be tested at 7 days, 28 days and at some longer period, specimens also will be retained for test at the time of actual failure

of the dam. Test specimens for the determination of characteristics other than strength will be sent to testing laboratories at the University of California.

The project is sponsored by the Engineering Foundation of which Alfred D. Flinn is director. The work is in the hands of the Committee of Arch Dam Investigation of which Prof. Charles D. Marx is chairman, and the subcommittee having immediate charge of the construction and tests is headed by Harry Hawgood as chairman. The experiment has been made possible through the generous financial co-operation of a large number of interested companies and by the Los Angeles County Flood Control District. The committee is desirous of receiving constructive criticism of its program, and any such communications should be sent to Mr. H. Hawgood, 722 H. W. Hellman Building, Los Angeles.

Frank Schram, general manager of the Southwestern Public Service Company, Roswell, was elected president; J. B. Ledlie, Mesilla Valley Electric Company, Las Cruces, first vice-president; Donald E. Bent, Tucumcari Light Company, Tucumcari, second vice-president; and B. L. Wiles, of the Albuquerque Gas & Electric Company was re-elected secretary and treasurer. K. W. Kissick of the Deming Ice & Electric Company, retiring president, was placed on the executive committee with E. A. Bradner of Las Vegas and Arthur Prager of Albuquerque. C. C. Ogle, of the Alba Pura Water Company of Las Vegas, also was named a member of this committee.

Although the program was billed for three days, the last portion of it was strictly of an entertainment nature and featured an overnight automobile trip to Jemez Springs, 65 miles northwest of Albuquerque to the La Esperanza ranch. Nearly one hundred made the trip. Although the barbecue was held indoors on account of the weather, the program of dances by Indians from the Jemez pueblo was staged in front of the hotel. The trip and the program which it included are said to be among the most novel convention features ever attempted in the electrical industry.

"New Mexico Utilities Association" New Name Decided on at Albuquerque Convention

Development of women's committee activities, the entry of utility companies other than electric into the organization, improved public relations policies, interesting technical developments in the electric industry, combined with a sketchy review of oil, cotton and other forms of business in New Mexico were the high lights of the eleventh annual convention of the New Mexico Electrical Association in Albuquerque, Feb. 15-17.

Nor was the Colorado River situation overlooked, as evidenced by the official utterance of Governor A. T. Hannett in an address of welcome at the opening session of the convention. He referred to the fact that as soon as Arizona decided upon acceptable terms some headway could be made.

Politics was an off issue of the convention, in fact every feature of the convention proved too successful to permit of its introduction in any form. All present acclaimed the manner in which the convention was arranged and conducted by Arthur Prager, manager of the Albuquerque Gas and Electric Company, and former president of the association, who is also first vice-president of the Rocky Mountain division, N.E.L.A.

Of especial interest was the presentation of technical papers by prominent educators in New Mexico, one, "The Automatic and Remote Control Operation of Electrical Machinery," by R. W. Goddard, professor of electrical engineering, New Mexico College of Agricultural and Mechanical Arts, and "Radio Interference from Distribution Circuits," by Philip S. Donnell, professor of electrical engineering, University of New Mexico.

Oil development in the Pecos Valley and electrical development in the cotton belt of New Mexico were the subjects of exposition by representatives from those sections of the state.

A large Colorado delegation was in attendance, including E. F. Stone, president of the Colorado Public Service Association, who made a talk on the activities of that organization, and A. C. Cornell, district manager of the Graybar Electric Company, and chairman of the Electrical League of Colorado, who talked on the relation of

the jobber to the utility. A plea was made by John J. Cooper of Denver for the utility men to consider the situation of the so-called "minimum customer" and to develop the interest of the latter, not alone in the service which he is receiving but to encourage an increase in the electric energy which he is using.

The establishment of a plan and the formation of a committee to work out Red Seal wiring operations in the larger cities of the state resulted from the paper presented by Kenneth A. McIntyre of the Society for Electrical Development.

"What is Behind Public Relations," was the subject of a talk given by Walter Heston, of the Electrical World, who also read a paper prepared by George Tenney, managing editor, Journal of Electricity, on "Recent Development of Domestic Load-Building Campaigns."

At the annual business session it was decided to invite other utility companies into membership and to change the name of the association to the New Mexico Utilities Association.

Hetch Hetchy Standby Service Asked for by Modesto

A request has been made by the Modesto Irrigation District upon the City of San Francisco for standby service of part of the power generated by the city's municipal Hetch Hetchy project, in accordance with the terms of the Raker Act.

The irrigation district has offered to install a step-down station of 9,000-kva. capacity, if the standby service can be obtained from Hetch Hetchy, and has offered to pay for the service at the rate of four mills a kw-hr. for 3,000 kw.

The request was referred to the public utilities committee of the Board of Supervisors, and that committee has invited representatives of the irrigation district to appear before it on March 3 with their engineers for the purpose of discussing the matter.



Delegates to the convention of the New Mexico Electrical Association, taken in front of the La Esperanza Hotel, at Jemez Hot Springs.

Northwest Electric Light & Power Association

Refrigeration, Ranges, Rates Discussed at Commercial Section Meeting

Characterized as a "high-powered" meeting, crammed full of facts ready to be carried home for future use, the first general meeting of the Commercial Section of the Northwest Electric Light & Power Association was held at the Davenport Hotel, Spokane, Feb. 18-19, 1926. More than sixty attended the meetings. No one subject dominated the attention of the meeting. Interest centered nearly equally around the discussions of the range, domestic refrigerator, commercial lighting, rural electrification and residential rates.

The meeting was called to order by the section chairman, P. M. Parry, commercial manager, Utah Power & Light Company, Salt Lake, who introduced V. G. Shinkle, secretary and treasurer, The Washington Water Power Company, Spokane, for the address of welcome. A. C. McMicken, sales manager, Portland Electric Power Company, Portland, responded, sounding the keynote of the meeting. Lewis A. Lewis, sales manager, The Washington Water Power Company, and president of the association next spoke by invitation from the chair, stating that in the past commercial departments of the power companies had not been on a par with such departments in other industries but that executive sentiment was changing in this respect, with the realization that some communities were not growing rapidly industrially and in population, and that an intensive cultivation of business possibilities among existing customers was necessary to produce revenue and to build up load factor.

The balance of the morning session was consumed in a discussion of domestic electric refrigeration, introduced by a member of the committee on that subject, George C. Sawyer, sales manager, Pacific Power & Light Company, Portland, in the absence of its chairman, J. F. Orr, sales manager, Idaho Power Company, Boise. Two definite proposals bearing on advertising policy and promotion methods came out of the deliberation following the report. These were passed, without dissent, the next day in the form of resolutions embodying the opinion of the meeting. The first, addressed to the refrigerator manufacturers, proposed that they co-operate with the central stations in eliminating the manufacturer's profit on such machines as could be placed in the homes of power-company employees. It was thought that a large hindrance to the promotion of this comparatively new device could be removed if a considerable number of officials and employees of the selling company would use the device and that the manufacturers should assist in making this possible. The second resolution was addressed to the executive committee of the Northwest asso-

ciation and was inspired in part by the fact that the Northwest Geographic Division of the Association of Commercial Ice Manufacturers had passed at a recent gathering in Seattle a resolution to be forwarded to the Northwest Electric Light & Power Association requesting a broad-gaged policy in advertising and selling the domestic machines which would not jeopardize the ice business. The Commercial Section's resolution recommended that the executive committee of the association urge its member companies so to conduct their advertising and selling activities as not to antagonize the commercial ice manufacturers, and that they not try to build domestic refrigeration load at the expense of the commercial ice industry.

Sales and Installation Points

Discussion on sales and installation methods and policies brought out the following points: that it is a specialist's job to sell and install; that the long-time trial system without obligation is satisfactory practice; that direct-by-mail advertising to selected prospects is effective; that the machine should be sold at list to produce a merchandising profit which will be needed to spend for promotion; that plants should not be installed in old, inadequately insulated ice boxes; that the sale is simplified if the box and machine are sold complete; that the plant should be installed in the basement with the box in the kitchen, or on the back porch in climates not cold in winter, it being pointed out that in extremely cold weather with the box outside, the machine does not operate enough to freeze ice; that some effort should be directed toward educating contractors and builders to build a refrigerator nook into the kitchen (the tendency in modern houses is toward small kitchens), and that this nook should be of sufficient size to hold a large refrigerator of accepted excellence rather than a locally built box, which in most cases is insufficiently insulated; that if the rate for energy is too low, it might not produce enough gross revenue to cover promotion; and that at some of the lower steps in rates in the Northwest the service will be rendered at a price far below its value.

The refrigeration committee plans to produce as part of its year's report a sample sales manual, as well as a suggested outline of the kind of advertising that should be carried on by selling agencies and manufacturers.

Opening the afternoon session, R. B. McElroy, assistant sales manager, The Washington Water Power Company, chairman of the electric cooking and heating committee, reported that his committee was gathering data from the member companies as to satura-

tion of ranges and water heaters, kilowatt-hour, and revenue statistics, and on selling and advertising policies. These data are to be compiled and presented in the committee's final report for the year.

Discussion went deeply into many phases of securing and handling range business, all of the member companies reporting on their practices. Some of the companies recently have raised their prices to list to allow the furniture stores, department stores and other dealers to sell ranges, believing that this will produce greater volume than the practice in the past of confining the selling agency only to power companies, which generally have offered them at prices close to cost. Disagreement with this new policy arose in some quarters, mainly on the ground that it introduced difficulties in servicing.

Policies on Old Ranges

Another interesting subject discussed concerned the policies toward taking in coal and wood ranges, in which Mr. McElroy explained the successful system used by his company in disposing of such ranges. This involved cleaning up the old ranges and setting up a man in the second-hand range business in a location separate from the company store. The success in this activity is predicated on taking the old range in at a fair value, and under the Spokane company's system this department has made expenses and turned over some profit. The matter of the advisability of conducting intensive campaigns of short duration or extending equal effort over the entire year was discussed without unanimous agreement.

Much interest was displayed in the water-heater discussion, all companies agreeing that they were not getting sufficient revenue from this business, which in the Northwest is carried on mostly by low-wattage flat-rate heaters. Insufficient data on the operation of high-wattage heaters on meter rates, under manual or thermostatic control, led to the hope that means would be effected by the N. E. L. A. to institute a series of tests on such heating business in California by the P. C. E. A. similar to the tests made by the range survey committee in the Northwest. Such tests should produce the necessary data to direct commercial managers toward a decision as to the best policy for developing the water-heating business.

Merchandising Committee Reports

In reporting for the merchandising committee, its chairman, V. H. Moon, appliance sales superintendent, Pacific Power & Light Company, stated that the committee was going to study the merchandising of light. He reported on two recent campaigns on commercial lighting, the first intensive effort in this activity in the Northwest, one conducted by his company, and one by The Washington Water Power Company, in which some startling results in the way of increased revenue were obtained at a remarkably small cost. W. R. Mathews, illumination engineer, The Washington Water Power Company, amplified Mr. Moon's remarks by calling attention to the accumulative effect of such effort, showing how the competitive spirit among merchants in a city led to the desire to

outdo one's neighbor in the matter of lighting up so that the intangible results of such a campaign were manifold. E. L. Crockatt, new business and public relations, Eastern Oregon Light & Power Company, Baker, Ore., told of a campaign put on in Baker which added considerable revenue at small expense, bearing out some of the figures presented by Mr. Moon in his report. P. M. Parry admitted to gaining excellent results from his lighting service bureau, which conducts this activity in Salt Lake the year round. He told of a stand-lamp campaign recently conducted, in which a two-way convenience outlet was offered with each lamp.

J. D. Scott, power sales engineer, Portland Electric Power Company, next reported for the power sales committee, defining the scope of his committee's activities to a study of possibilities in the industrial heating field. This business depends on population and industry and offers a fairly large opportunity in some centers in the territory. Enameling plants and glass annealing plants are two of the principal classes of prospects, and both involve highly technical processes. Especially trained heating engineers are required by the power companies contemplating entry into this field. In districts where these businesses have been developed, notably the bay district in California, a great deal of experimentation with equipment has been necessary before satisfaction with electricity for fuel has been manifested. Among the possible new uses in the field are stereotype pots in newspaper plants and air refrigeration in theaters. One of the principal obstacles encountered in getting manufacturers to change from other types of fuel to electricity is the large expense in equipment involved, making it necessary for the power company to help finance the customer often in large amounts.

R. W. Fayville, sales engineer, Northwestern Electric Company, Portland, told of the possibilities in the bakery field, citing instances in which the installation of an electric oven has saved enough labor to pay for the energy consumption. He stated that it was necessary to work in close co-operation with the oven manufacturers.

Rural Electrification

The Friday morning session was opened by a report on rural electrification by L. A. McArthur, vice-president and general manager, Pacific Power & Light Company, Portland, who heads the association committee and is a member of the national committee on this subject. He told of the origin of the need for investigation and something of the work of the National Committee on Relation of Electricity to Agriculture, stating that some difference of opinion existed as to the theory of the rate to charge for rural service. In some sections of the country the policy is to make the rate carry the extra investment charges, while in the Northwest both central-station companies and regulatory bodies favor a rate but little higher than urban rates, with an advance payment of revenue to absorb the carrying charges on the unproductive portion of the investment. One of the rate theories advanced is

that the concentrated urban business should be made to help support the thinner rural business as far as power-company revenues are concerned. He told of a new rural electric service instituted by his company, a description of which will appear in an early issue of the Journal of Electricity.

In introducing the next speaker, E. C. Johnson, dean of the College of Agriculture, Washington State College, Pullman, Mr. McArthur paid a tribute to the quality of co-operation being received from state colleges and experiment stations, which logically have furnished the neutral ground on which to bring together the various interests in investigating the possibilities. Both Oregon and Washington have active committees that have made surveys of the situation in their respective states and are continuing studies of specific subjects suggested by these surveys. He called attention to the finding of the Oregon committee that 15 per cent of Oregon farms were electrified and that it would cost \$20,000,000 to build distribution lines alone to reach all of the farms of the state.

Washington Agricultural Survey

Dean Johnson described the organization of the Washington Committee on Relation of Electricity to Agriculture, of which he is the head, and told some of the findings of that committee in its survey conducted last year. The state was divided into districts according to different agricultural conditions, and the saturation of electrified farms, which was over 20 per cent, and the extent to which electricity was used on them, were discovered by this survey. Subjects for investigation during 1926 and subsequently embrace in part the following: the possible uses of electricity in poultry-raising, the community motor, stationary spray pumping, cost of operating wood and coal ranges in comparison to electric ranges, and possibilities in household appliances. The last two were chosen in an attempt to promote the general well-being of the farmer by making his living conditions more attractive, thus tending to keep him and his children on the farm.

W. R. Putnam, vice-president and general manager, Idaho Power Company, Boise, in discussing the subject, stated that in certain localities economic influences prevented the transfer to city customers of any considerable portion of the cost of furnishing rural service, as has been suggested. Some companies have no large concentrations of urban business on which to saddle such burden without hurting the city business. A. C. McMicken called attention to an obstacle in the way of complete rural electrification, in that many farmers could not afford to buy the expensive equipment required to make extensive use of electric service. He urged that the companies not be impatient in expecting immediate results from the work of the state committees, saying that some years would be required before any great good could come of this work.

Range Survey Report

The next subject on the program was the report of the range survey subcommittee, N. E. L. A., by Lewis A. Lewis, chairman. With the aid of

stereopticon slides he produced curves and charts resulting from the spring tests in Spokane and Boise last year, as published in N. E. L. A. report 25-91, September, 1925, and abstracted in the Journal of Electricity, Oct. 15, 1925, p. 284. In addition he showed new curves produced in the subsequent winter tests and explained the significance of these data, stating that all the material will be compiled in the final report of the committee at this year's N.E.L.A. convention and cannot be released for publication prior to that time. The intent of the report will be to place in the hands of commercial executives data that can be applied to the system of any particular company, enabling that company to determine whether or not the range business can be made profitable to it.

Residential Lighting Rates

At this point in the meeting an informal discussion of residential lighting rates was introduced, bringing out a variety of opinions as to the merits and demerits of different types of rates. Block rates, room rates, demand rates, load factor rates, and rates based on cost of service, value of service and on what the traffic will bear, were discussed primarily from the standpoint of what constituted an inducement for customers to use more service and create a better load factor. L. R. Jefferson, Electric Bond & Share Company, New York, took part in the discussion, at the suggestion of the chair, telling the results of different types of rates in Eastern cities.

The meeting closed after James S. Carson, American & Foreign Power Company, New York, visiting the meeting, and likewise invited by the chair to speak, told of interesting experiences in conducting a central-station business in Latin America.

Interesting Program Planned for Technical Section Meeting

The program of the third annual general meeting of the Technical Section, to be held at the Olympic Hotel, Seattle, March 11-12, 1926, though incomplete at the time this is printed, indicates that the meeting will be the most interesting yet held by that section. The scheduling of prominent speakers outside the section membership on subjects closely related to the work of the engineers promises to give the meeting a general interest even greater than that of last year.

Among the outside speakers secured for the occasion are Col. William Kelly, director of engineering, N. E. L. A., who is scheduled for Thursday morning on a subject not yet announced; Franklin T. Griffith, president, Portland Electric Power Company, Portland, who will address the meeting Friday, March 12, on the "Relations of the Employees to the Public," with particular reference to construction and engineering employees; and C. W. Fick, General Electric Company, Portland, to speak Thursday afternoon on "New Electrical Applications to the Paper Industry." A. W. Leonard, president, Puget Sound Power & Light Company, Seattle, will welcome the visitors, and Lewis A. Lewis, sales manager, The Washington Water Power Company,

Spokane, and president of the association, will respond.

Other speakers outside the Technical Section scheduled for talks as part of the programs of the different committees are: a member of the Department of Public Works, State of Washington, and a man from the Department of Labor and Industry of that state, both of Olympia, but neither named as yet, as part of the program on the committee on co-operation with regulatory bodies, Thursday morning; M. E. Arkills, safety engineer, Water Front Employers, Seattle, on "Economic Value of Accident Prevention," for the accident prevention committee, Thursday morning; and Lyman Griswold, consulting engineer, Portland, on "Rock and Earth Fill Dams," for the hydraulic power committee, Thursday afternoon.

While all committees are allotted a portion of the time during the two-day session for a presentation of certain phases of their work, all the specific subjects have not been outlined definitely at this time. Those that have been scheduled, besides the above mentioned, are as follows: Accident prevention committee, Thursday morning, "Selling Safety" and "History of Accident Prevention in the Northwest," by G. I. Drennan, field superintendent, Pacific Power & Light Company, Walla Walla, Wash.; hydraulic power committee, Thursday afternoon, "General Survey of Committee Studies," by O. L. LeFever, superintendent, Northwestern Electric Company, Portland; "Paints Adaptable for Hydraulic Use," by E. H. Collins, assistant engineer, The Washington Water Power Company, Spokane; and "Economics of Hydroelectric Design," by C. P. Dunn, designing engineer, Portland Electric Power Company, Portland; apparatus committee, Thursday afternoon, "Mechanical Troubles with Late Types of Oil Circuit Breakers," by Walter Hendron, engineering department, Utah Power & Light Company, Salt Lake City; and "Differential Protection of Neutral Grounding of Generators and Transformers," by R. Rader, engineering department, central district, Puget Sound Power & Light Company, Seattle; underground systems committee, Friday afternoon, "Constructive Criticism and Suggestions for Future Development of Underground Distribution System Apparatus," by J. M. Gilham, underground superintendent, Portland Electric Power Company, Portland, with discussion led by C. H. Hoge, construction superintendent, central district, Puget Sound Power & Light Company, Seattle; and "Manhole Ventilation," by S. B. Clarke, superintendent of underground department, Northwestern Electric Company, Portland, with discussion led by F. L. Rohrbach, underground engineer, The Washington Water Power Company, Spokane.

Committees not yet announcing their definite programs are: Inductive coordination committee, Thursday morning; overhead systems committee, Friday morning; meter committee, Friday afternoon; and prime movers committee, Friday afternoon.

Mike: "Don't you think that the violinist's obligato is beautiful?"

Ike: "I can't say just yet; wait until she turns around."—Two Bells.

Pacific Coast Electrical Association

Final Report of S. F. Conclave of Technical Section

Underground Committee Studies Current Problems

By N. B. Hinson, Vice-chairman

The Jan. 15 meeting of the underground systems committee at the San Francisco conclave was handicapped somewhat by the absence of the chairman, P. E. Chapman, who was ill. However, Mr. Chapman's written report of his trip East to the October national group meetings in Detroit was presented to the committee and aroused a great deal of interest.

According to the report, Mr. Shaw, chairman of the national underground systems committee, N. E. L. A., in outlining the work of that committee stated: "The underground pioneer work is mostly done by a few of the larger companies and if the industry is to progress the underground systems committee must always be somewhat in the lead as regards underground installations. This calls for special work on the committee's part and work which the smaller companies cannot undertake."

In line with this a report of the 75-kv. cable installation being made at Philadelphia and also a report of the 132-kv. cable installations under way in New York and Chicago were read. Interesting discussion followed the presentation of these reports although no Pacific Coast company operates cables at voltages higher than 44 kv. All agreed, however, that some of the Pacific Coast companies may be ready to install cables for higher voltages in the near future. In this event the experience gained by the Eastern companies will be of vital importance.

Increasing use of cement duct has caused considerable interest and discussion pertaining to this type of construction. Several reports were given covering the use of this type of duct. H. H. Buell, of the Pacific Gas and Electric Company, gave a very interesting report on the chemical action of the free lime in the cement on the lead sheath. All companies using cement duct will be glad to learn that these tests have shown that there is no action which will damage the lead sheath. A serial report has been published by the committee (page 52, Jan. 15 issue, Journal of Electricity) giving some data on this subject.

Various new types of motor-driven pumps for underground work were discussed at the meeting. The fact was brought out that there are several new types on the market that are capable of emptying a manhole in less time than the older methods.

The various methods of keeping underground cable, duct and manhole data were discussed. Copies of the different systems used on the Pacific Coast were sent to the chairman of the national subcommittee some time ago. The determination of the temperatures of underground cables and

ducts is receiving much attention, and some definite data on experimental installations will be ready in the near future.

Executive Committee to Meet in Los Angeles March 11

A meeting of the executive committee of the Pacific Coast Electrical Association has been announced by Samuel H. Taylor, secretary, to be held at the offices of William Baurhyte, president of the association in Los Angeles March 11. The meeting is to take place in the Los Angeles Gas and Electric Corporation's building at 810 South Flower Street, and is to begin at 2 p. m.

Commercial Section to Hold General Meeting.—March 5 and 6 have been set as the dates for a general meeting of the Commercial Section P. C. E. A. This meeting, which will be held in the auditorium of the Los Angeles Gas and Electric Corporation Building in Los Angeles, will be devoted to putting the Section's papers into proper form for the papers committee, the papers to be presented to the Section chairman for approval at this conference. The work the Commercial Section expects to do at the annual convention also will be discussed.

Plans Under Way for Technical Conclave in Fresno

April 7, 8 and 9 will be busy days for the Technical Section. The Fresno conclave will hold forth on those dates.

While it is not possible to give a detailed program at this time it is known that many matters of importance will come up. The year's work will be rounded out and preliminary plans laid for next year's activities. Although all completed reports to be published prior to the June convention must be submitted to the editing committee in March, much remains that is not complete; thus there is plenty of work in view for the Fresno meetings. In addition to this more or less routine work, the delegates who attended the national group meetings at Kansas City in February will give reports covering the more important features discussed at those meetings.

Entertainment and general arrangements are in the hands of L. J. Moore of the San Joaquin Light & Power Corporation. Many attractive features are promised, including trips to the Balch project and other interesting places.

Permit Granted for Power Project on Deer Creek, California.—P. B. Cross of San Francisco has been granted a permit by the California Division of Water Rights for the development of a power project on Deer Creek, Tehama County, Calif. It is estimated the cost of development will amount to \$1,669,648.



News of the Electragists



Electragists of Oakland Begin Work on Red Seal Plan

Definite plans for the operation of the Red Seal Plan in Alameda and Contra Costa Counties were outlined at a meeting held at the Newport Restaurant in Oakland, Calif., Feb. 10. The meeting was attended by seventy-five electragists and other members of the electrical industry.

Laurence R. Chilcote, secretary-manager of the Electrical Contractors and Dealers' Association of Alameda County, presided over the meeting and acted as toastmaster. Clyde Chamblin, president of the California Electrical Construction Company, San Francisco, told the history and development of the Red Seal Plan. He stated the California Electrical Bureau had been granted the sixteenth license from the Society for Electrical Development for the use of the Red Seal Plan. Mr. Chamblin urged everyone in the electrical industry to bring his own home up to the standards of the Red Seal Plan, and stated that all should have all-electric homes. Aside from the personal convenience provided in this way, the sales arguments obtained through personal experience are very valuable in selling similar jobs.

The plan of operation in California was outlined by Victor W. Hartley, executive secretary of the California Electrical Bureau. He stated the standards of the Red Seal Plan are those which reasonably could be expected to be put into every home. Copies of the specifications were distributed to those present. An exhibit of the job card, meter seal and other Red Seal material was shown.

C. Felix Butte, Butte Electrical Equipment Company, San Francisco, chairman of the Northern Division of the California Electragists, stated the electragists were charged with the responsibility of carrying out the operation of the plan. He emphasized the value of the plan to the electragists, and forcibly brought this to their at-

tention by reference to the history of the convenience outlet.

George Bernhard, manager of the East Bay division of the Great Western Power Company, and chairman of the Red Seal committee for district nine comprising Alameda and Contra Costa Counties, urged the co-operation of all members of the industry in making the plan successful. Mr. Bernhard stated that material would be available at power-company offices; also, that samples of all material would be displayed prominently and that someone would be in charge to give out complete information relative to the Red Seal Plan.

Lew Galbraith of the Pacific Gas and Electric Company, vice-chairman of district nine, said that the big job before the industry was the creation of a desire for Red Seal homes on the part of the public. A display board was shown on which service, conduit and wire, switches and meter were mounted as a means of showing customers some of the material necessary to make a range installation.

Harry Woodward, general sales manager of the Great Western Power Company of California, spoke of the accomplishments of the California Electrical Bureau and the good that has resulted from the efforts of the men working for it.

Western Electrical Inspectors Join International

The Western Association of Electrical Inspectors became the Western Section of the International Association of Electrical Inspectors at its twenty-first annual meeting held at the Hotel Sherman, Chicago, January 26-28, 1926. It is hoped that this will be a means of stimulating national interest in the Code and pave the way for a larger and more efficient participation in the work of solving those problems of the electrical industry which relate to the wiring of buildings.

The principal subject under consid-

eration at the convention was the solution of the fuse-abuse problem, and many helpful suggestions were made to guide inspectors in handling this important feature of electrical inspection work. Practically all of the speakers agreed that the solution lay in successfully conveying to the public that the fuse is the safety valve of the electrical installation; further, that a special design of branch-circuit fuse in conjunction with the sealing of the service fuses, together with a firm stand on the part of the municipality to discourage fuse tampering, would contribute to the bringing about of safe fuse conditions. One other outstanding note of the meeting was a clearer realization on the part of the inspectors that they must be of greater service to the public.

This may be accomplished by a more intelligent enforcement of the National Electrical Code, a more complete co-operation with fellow inspectors in preserving the Code by refraining from the adoption of special rules, co-operating with other members of the electrical industry in each community, and protecting the public against the sale of illegitimate material and fittings.

Inspectors to Meet in San Diego in March.—Announcement has been made that the California Association of Electrical Inspectors will hold its next semi-annual meeting in San Diego March 22-24. It is expected that a uniform electrical code for California cities will be one of the important subjects discussed. Complete details of the meeting will be announced in the March 15 issue of the Journal of Electricity.

H. H. Walker, president of the California Electragists, has been elected a vice-president of the Los Angeles Electric Club.

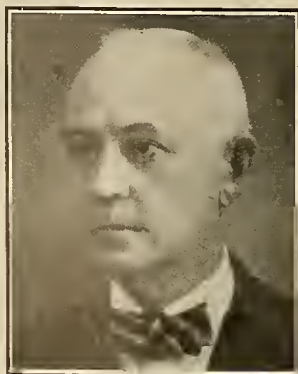
Kaelin & Beer Electric Works, specialists in the repair and maintenance of electric tools and motors, is a newly opened firm at 211 Venice Boulevard, Los Angeles. H. F. Kaelin was formerly shop superintendent for the Electric Tool & Repair Service Company of that city.

Atlas Electric Company, San Francisco, now is located in its new home at 343 Fourth Street. The company formerly was established at 1318 Polk Street and 185 Stevenson Street.

Officers of the newly formed Northwest Association of Electrical Inspectors, elected at the convention of that association held in Portland, Jan 11-12, 1926:



President—L. W. Going, chief electrical inspector, city of Portland, Ore.



Vice-president—W. P. Weathers, chief electrical inspector, city of Longview, Wash.



Secretary and treasurer—F. D. Weber, engineer Oregon Insurance Rating Bureau, Portland.

Meetings

Los Angeles Electric Club Holds Election of Officers

Combining business with pleasure the Los Angeles Electric Club in the midst of an interesting entertainment arranged by R. H. Ballard, executive vice-president of the Southern California Edison Company, chairman of the day, held its annual election of officers. The following officers were elected: President—S. E. Gates, of the General Electric Company; vice-presidents—C. A. Heinze, Bureau of Power and Light; H. E. Sherman, Jr.,—Illinois Electric Company; H. H. Walker—H. H. Walker Company; secretary-treasurer—L. E. Mozelle, Bureau of Power and Light; and sergeant-at-arms—H. H. Ranlett, Los Angeles Gas and Electric Corporation.

The executive committee consists of F. E. Geibel, Pacific Electric Railway Company; H. C. Lauderback, Southern California Telephone Company; D. L. Scott, Los Angeles Gas and Electric Corporation; Ray Carruthers, Southern California Edison Company; and G. E. Maudslay, National Carbon Company.

This busy day was also ladies' day, and many members of the fairer sex were present to enjoy the singing of the Edison Chorus and soloist, Miss Mildred Ware.

Interesting Annual Report of Employees' Association

The Traction and Power Mutual Aid Association, composed of employees of the Utah Light & Traction Company, the Utah Power & Light Company, Phoenix Utility Company and Western Colorado Power Company, held its annual meeting Dec. 16 at Salt Lake City and elected the following officers for the ensuing year: president—W. M. Scott; vice-president—G. Alm a Gardner; secretary—J. R. Mathews; treasurer—A. M. Rust; directors—Lester Seare, Paul Ashworth, Frank Pickering, J. M. Lindsay and R. M. Parr; auditors—George Partridge, W. E. Zwick; physician—C. E. Openshaw.

The secretary's report showed that the association paid during the year 1925 death claims amounting to \$6,000, and for sickness, accident and service refunds the sum of \$4,656.50. A surplus amounting to \$14,303 was divided among the members in the usual form of a Christmas dividend of \$15.16 each for twelve months' membership and fractional time at the same ratio. Nine hundred and seventy-nine members participated in this distribution. The total enrollment now is near the 1,000 mark.

San Diego Electric Club Holds Annual Election

At the annual election of the San Diego Electric Club, San Diego, Calif., held Jan. 19, C. C. Clardy, prominent San Diego electragerist, was elected president, succeeding Herbert Rose. Other officers elected were: first vice-president—Ray C. Cavell, of the San

Diego Consolidated Gas & Electric Company; second vice-president—C. A. Stevens, manager, Pacific Telephone & Telegraph Company; secretary-treasurer—Percy H. Adams, San Diego Consolidated Gas & Electric Company.

The following five were elected on the executive committee of the organization: H. H. Watson, Al May and W. H. Talbott, of the San Diego Consolidated Gas & Electric Company;

COMING EVENTS

Commercial Section, P.C.E.A.—

General Meeting—Los Angeles, in auditorium of Los Angeles Gas and Electric Corporation Building, March 5-6, 1926.

Technical Section, Northwest Electric Light and Power Association—

Annual General Meeting—Seattle, Wash. March 11-12, 1926

Executive Committee, Pacific Coast Electrical Association—

Meeting in office of William Baurhyte, President, Los Angeles Gas & Electric Corporation Building, Los Angeles, March 11, 1926.

Transportation Section, P.C.E.A.—

Pacific Gas and Electric Building 245 Market Street, San Francisco, March 12-13, 1926.

California Association of Electrical Inspectors—

San Diego, Calif., March 22-24, 1926.

Electrical Men of Colorado—

State-wide meeting under sponsorship of Electrical League of Colorado Denver, March 26, 1926

Technical Conclave, P.C.E.A.—

San Joaquin Power Building, Fresno, Calif., April 7-9, 1926.

Transportation Section, P.C.E.A.—

San Francisco, April 23-24, 1926.

Advertising Section, P.C.E.A.—

San Francisco, Calif., April 30, 1926.

National Electric Light Association—

Annual Convention—Atlantic City, N. J. May 17-21, 1926.

Electrical Supply Jobbers' Association—

Annual Convention—Hot Springs, Va. May 31-June 4, 1926

Pacific Coast Electrical Association—

Annual Convention—Biltmore Hotel, Los Angeles June 8-11, 1926

Associated Manufacturers of Electrical Supplies—

Annual Convention—Hot Springs, Va. June 7-12, 1926

Northwest Electric Light and Power Association—

Annual convention—Spokane, Wash. June 16-19, 1926.

Ralph Chase, representative of Westinghouse Electric & Manufacturing Company, in San Diego, and Herbert Rose, retiring president.

Members of the San Diego Consolidated Gas & Electric Company presented a one-act skit; and special musical numbers, dances and other entertainment features arranged by W. H. Talbott, completed an enjoyable program.

Utah Company Elects Officers.—

At the annual meeting of the stockholders of the Utah Power & Light Company held at Roosevelt, Utah, Feb. 8, the following officers and directors were elected for the ensuing year:

President and director—Horace Coltharp, of Vernal; vice-president and director—J. R. Reeder, of Vernal; treasurer and director—Augustus C. Emmert, of Roosevelt; secretary and director—George Adams of Vernal. Other members of the board of directors are: Willis Johnson, Walter McCoy and Abner Richens, all of Vernal. A. C. Emmert, who has been active manager of the company for the past three years, will continue in that position. The Uintah Power & Light Company is serving the towns of Roosevelt, Myton, Duchesne, Upalco and Neola, Utah.

Book Reviews

SUPERPOWER—ITS GENESIS AND FUTURE

By W. S. Murray, Murray and Flood, Engineers; Engineering Chairman, U. S. Government Superpower Survey, 9 x 16 in. 228 pp. Illustrated. McGraw-Hill Book Company, Inc., New York, N. Y. \$3.

It is extremely fitting that W. S. Murray, one of the fathers of the superpower idea, should interpret the economic and social aspects of this subject. Having become a byword with politician, press and public, it is time that a comprehensive discussion of the subject be brought out before the threatened misinterpretations of the question become real.

In clarifying the meaning of the word Mr. Murray begins with the start of power development in this country and traces its influence on the social and economic life of the people. He points out that superpower is merely the name applied to the plan for getting the best and most nearly universal power service for the nation. He deals with ownership and makes an excellent case for the private utilities.

Briefly reviewing the superpower report of 1918, he shows what has been done to carry out the recommendations made in that early survey. One of the interesting chapters of his book deals with railroad electrification. Mr. Murray argues for a standard electrical system for the contact point and states that every system of electrification tried has been found successful. He shows that utilities should furnish power to railroads and that this would fit in admirably with the economic and social aspects of superpower.

The political aspects of the superpower situation are dealt with, including the place of the Interstate Commerce Commission, the state utilities and the national government. In the opinion of Mr. Murray, the state regulation of utilities is advisable and machinery exists for taking care of any superpower development that involves interstate questions. Superpower, Mr. Murray maintains, is a method of procedure and not a corporation, and its financing problems should be dealt with as are those of utility companies. Charts, statistical data and tabulations are included in the book.

Personals

E. D. Kilburn, recently elected vice-president and general sales manager of the Westinghouse Electric & Manufacturing Company, is making a two-months business trip, during which he will visit the several Pacific Coast offices of his company. He arrived in San Francisco Feb. 19. His present trip is partly one of inspection, but



E. D. KILBURN

while on the Coast he will spend much of his time studying the needs of the great hydroelectric power developments of northern California in the way of new devices, improvements in apparatus and further manufacturing research. Mr. Kilburn received his appointment by the board of directors as vice-president and general sales manager of the Westinghouse company in 1925. In his present position he has direct charge over the sales activities of the company. Mr. Kilburn entered the Westinghouse organization as a graduate student in 1906. Six years later he joined the Westinghouse Machine Company, remaining there in a sales position until 1916 when he was appointed manager of the power and railway departments of the New York office of the Westinghouse Electric & Manufacturing Company. After a year's time he was made manager of the New York district, retaining that position until 1920 when he was made vice-president and general manager of the Westinghouse Electric International Company, the post he held prior to his present capacity. Mr. Kilburn was born in Malone, N. Y., in 1882 and holds degrees from Cornell University in both mechanical and electrical engineering.

E. A. Prokop, engineer in charge of the tunnel work at the Cushman power development project, Tacoma, Wash., has been appointed to take charge of construction of twelve miles of tunnels and appurtenant hydraulic structures for the new water-supply system for the city of Detroit.

B. C. Watts, Denver jobber, has been named head of a committee to investigate and report to the Electrical League of Colorado on the price maintenance bill recently introduced in Congress.

Ed F. Sixtus has been made sales and service engineer for the central California district of the Pacific Electric Manufacturing Company, with headquarters in San Francisco. Mr. Sixtus is very well known throughout the territory, having established many contacts and personal friendships in the industry during the past fifteen years.

F. W. Doolittle, vice-president, North American Company, New York City, has been making an extensive inspection trip over the properties of the Great Western Power Company of California and the San Joaquin Light & Power Corporation, accompanied by J. B. Black and A. Emory Wishon, vice-presidents and general managers, respectively, of those two subsidiary corporations.

O. R. Doerr, formerly manager of the home department of the Oakland division of the Great Western Power Company of California, has become manager of the heater division of the Magnavox Company, Oakland. He is at present making an extensive Eastern trip.

H. W. Dennis, construction engineer, Southern California Edison Company, Los Angeles, attended a meeting of Engineering Foundation's arch-dam investigation committee in San Francisco on Feb. 11 at which plans for advancing the work described elsewhere in this issue were discussed. This was the first meeting to be presided over by Prof. C. D. Marx, the newly elected chairman.

Lafayette Hanchett, president of the Utah Power & Light Company, has been elected chairman of the board of directors of the Salt Lake City branch of the Federal Reserve Bank of San Francisco. Mr. Hanchett succeeds G. G. Wright, who served as chairman during the past year.

Ray W. Turnbull, San Francisco, Pacific Coast district manager of the Edison Electric Appliance Company, was in Los Angeles on business not long ago.

F. J. McEniry, head of the publicity department of KOA broadcasting station of the General Electric Company in Denver and formerly a staff member of the electrical league in that city, was a Pacific Coast visitor recently.

A. E. Holloway, superintendent commercial department, represented the San Diego Consolidated Gas & Electric Company at the recent convention of California Electragists at Catalina. Mr. Holloway was appointed chairman of District No. 23, San Diego County.

George B. Muldaur, general agent of the Underwriters' Laboratories, Inc., New York City, visited Portland on Jan. 25 and 26, on a tour of the Pacific Coast for the purpose of addressing chambers of commerce, Rotary clubs and other civic bodies, on the subject of "Underwriters' Laboratories Service in Fire Prevention." He spoke before the Portland Chamber of Commerce and the Portland Rotary Club.

R. L. Watts, of the firm of Lewis & Watts, engineers, specializing in power plant design and construction, with offices in Seattle and Portland, has sold his interest to H. H. Lewis, who will conduct the business under its present name. Mr. Watts is joining the Compressed Spruce Products Company, Inc., in which he is interested.

J. A. Harlan, executive of the Delco Light Company, Dayton, Ohio, recently spent a week in Los Angeles. He was making a survey of economic conditions throughout the country, Los Angeles being the last stop on his itinerary prior to his return home.

W. H. Davie, district manager of the Los Angeles office of Allied Industries, Inc., W. H. Klinger, vice-president of the company with headquarters in Los Angeles, R. C. Shipman, district manager at Seattle, W. J. Cottrell, district manager at Portland, and S. P. Vonah, district manager of the Oakland office, attended the recent district managers' meeting of the Allied Industries, Inc., held in San Francisco.

A. M. Chitty has been named manager of the southern district of the Puget Sound Power & Light Company, which embraces territory from Olympia, Wash., south to the Columbia River. Mr. Chitty's headquarters will be in Chehalis, Wash., where the company has taken offices in the Elks Building. He succeeds E. T. Steel, who becomes manager for the company's western district, with headquarters in Bremerton, Wash.

E. T. Steel, newly appointed manager of the western district of the Puget Sound Power & Light Company, was a recent speaker before the Rotary Club, at Port Angeles, Wash. In his address Mr. Steel explained the service and rates that the company offers its customers. J. L. Keeler, resident manager of the Puget Sound Power & Light Company at Sequim, Wash., also addressed the club, explaining the company's activities in Clallam County. He also gave an explanation of how public service utilities are regulated by the state.

William H. Hawkes, formerly treasurer of the Puget Sound Power & Light Company, at Olympia, Wash., has been appointed assistant treasurer of the company for the entire eastern district. He will remove to Wenatchee.

L. W. Failor, manager of the offices of the Puget Sound Power & Light Company at Auburn and Sumner, Wash., has been transferred to Olympia where he will have charge of the sales department. He is succeeded by Roy McGandy, who has been assistant manager for several years.

Max K. Stewart, formerly division sales manager, Pacific Gas and Electric Company, Redding, Calif., has become a representative of the Walker-Pratt Manufacturing Company, with headquarters in San Francisco.

E. C. Van Diest, organizer and president of the Western Public Service Company which sold its holdings in Wyoming, Nebraska, Colorado, Missouri and Texas to Stone & Webster several months ago, has retired definitely from the utility business. Mr. Van Diest is devoting his time to the interests of the Kiwanis Club in the Rocky Mountain region as immediate past governor in connection with child welfare work. He also heads the committee in Colorado Springs, Colo., which will build a new stadium at Colorado College.

Ralph Pool, vice-president in charge of operations of the Western Public Service Company with headquarters at Colorado Springs until purchase of that company by the Stone & Webster interests several months ago, has joined the ranks of the Electric Bond & Share Company.

D. C. McClure, general superintendent of the St. Joseph Light, Power & Railway Company, St. Joseph, Mo., and formerly superintendent of the electric department of the Public Service Company of Colorado, Denver, has resigned his position to become vice-president of a Midwestern utilities holding company with headquarters in Chicago. Mr. McClure at the time of his transfer to the Missouri property was president of the Rocky Mountain Division, N.E.L.A.

H. E. Mahan, illuminating engineer for the General Electric Company at Schenectady, spent several days not long ago in San Diego in connection with navy research work.

E. O. Shreve, manager of the San Francisco district, General Electric Company, and J. V. Anthony, Pacific Coast auditor for the same company, were recent business visitors in Los Angeles.

C. E. Heise, district manager, Westinghouse Electric & Manufacturing Company; H. E. Sandoval, general manager, Sandoval Sales Company; F. H. Woodward, general sales manager, Great Western Power Company, and Victor W. Hartley, executive secretary, California Electrical Bureau, all of San Francisco, attended a meeting of the advisory committee of the California Electrical Bureau in Los Angeles a short time ago.

F. F. McCammon, of the Public Service Company of Colorado, and Charles Sterne, of the Arapahoe Power & Light Company, were the official Denver representatives at the recent N.E.L.A. range committee meeting in Salt Lake City.

E. K. Higginbottom, representative of the Kuhlman Transformer Company has been working in the Mountain region for a number of weeks with the district representatives of the company, the Globe Electric Supply Company of Denver.

B. E. Rowley, district manager of the Edison Electric Appliance Company, has been elected vice-chairman of the Rocky Mountain Electrical Co-operative League in Salt Lake City recently.

Lafayette Hanchett, president of the Utah Power & Light Company, addressed the engineering students of the University of Utah in Salt Lake City at a special assembly on Jan. 26.

H. P. Whitten, division manager of the Apex Electrical Distributing Company, Denver, has been transferred to the Northwestern district of the company with headquarters at Seattle.

R. S. Willoughby, R. L. Lindsay and C. S. Morash recently have entered into a new electrical enterprise in Denver. They are incorporated under the name of Gainaday Distributing Company and will be established at 232 Fifteenth Street.

Charles Franck, vice-president and general manager of the Holophane Glass Company with headquarters in New York City, is a visitor on the West Coast with his family. En route he stopped at Chicago and Denver in the interest of company representation.

Arthur Prager and C. L. Pinkerton, of the Albuquerque Gas & Electric Company, Albuquerque, N. M., visited Denver late in January in the interest of the recent annual convention of the New Mexico Electrical Association in Albuquerque.

L. M. Cargo, district manager of the Westinghouse Electric & Manufacturing Company in Denver and a recent visitor to San Francisco and Los Angeles, is chairman of the special program committee arranging the statewide meeting of electrical men to be held in Denver March 26 under the auspices of the Electrical League of Colorado.

A. W. Berresford, for about twenty years vice-president and general manager of the Cutler-Hammer Manufacturing Company, Milwaukee, recently was appointed executive vice-president of the Nizer Corporation, Detroit, which not long ago was consolidated with the Kelvinator Corporation and the Grand Rapids Cabinet Company, operating as divisions of the Electric Refrigeration Corporation. Mr. Berresford is a past president of both the Electrical Manufacturers Club and the Associated Manufacturers of Electrical Supplies and at present is vice-president of the American Engineering Council.

F. C. Gordon, manager of the insurance department, Byllesby Engineering & Management Corporation, visited the San Diego Consolidated Gas & Electric Company early in February. Mr. Gordon has been touring the Coast, making a close study of the safety practices of various companies.

C. A. Semrad, vice-president and general commercial manager of the Public Service Company of Colorado, visited the New York offices of the Doherty Company early in February.

H. L. Williams, manager of the Evanston (Wyoming) division of the Utah Power & Light Company, has been re-elected as a director of the Rocky Mountain Committee on Public Utility Information.

J. F. Lincoln, executive vice-president of the Lincoln Electric Company, Cleveland, has been making a six-week trip to the important industrial territories in the country. Included in his Western itinerary are Los Angeles, San Francisco, Portland, Seattle, El Paso, and Phoenix.

Edward A. Sipp, formerly project electrical engineer for the Army Air Service Engineering Division at McCook Field, Dayton, Ohio, in charge of development of electrical gun synchronizers, airplane, airdrome and airways illumination, electrical wire and cable, and miscellaneous electrical equipment, has been appointed aviation research engineer in charge of the development of special cables for airplane and similar products manufactured by the Belden Manufacturing Company, Chicago.

Marjorie A. Stolz, formerly supervisor of educational work for the Proctor & Gamble Distributing Company in different localities in California, has joined the force of the Walker & Pratt Manufacturing Company as home economist in charge of educational work throughout the West. Max K. Stewart, formerly sales manager for the Shasta division of the Pacific Gas and Electric Company, has become the representative of the Walker & Pratt Company in northern California, and John W. Carpenter the company's representative in southern California. These changes recently were announced by Burton Y. Gibson, Pacific Coast manager.

G. P. Baldwin, general merchandising manager of the General Electric Company, recently was elected a vice-president of the company at a meeting of the executive committee. In his new position he will have charge of activities connected with the electrification of steam railroads and such other duties as may be assigned by the president. His new headquarters will be in New York City. Mr. Baldwin was born in San Francisco in 1874, and graduated from Leland Stanford University in 1896 with the A. B. degree. In the following year he entered the employ of the Stanley Electric Manufacturing Company. At that time Mr. Baldwin became vice-presi-



G. P. BALDWIN

dent of the Blaisdell Company of Los Angeles where he remained until March 16, 1910, when he was made manager of the Pittsburgh office of the General Electric Company. In 1915 he was made manager of the Atlantic district with headquarters in Philadelphia. When the merchandising department was created in 1923 he was made its first manager.

Miss Edith Clarke, an engineer of the General Electric Company at Schenectady, N. Y., for the past six years, and one of the five women members of the American Institute of Electrical Engineers, was the first woman ever to address the Institute when at its recent midwinter convention in New York City she delivered a paper on "Calculation of Steady-State Stability in Transmission Lines."

Herbert Cram, formerly with Landers, Frary & Clark, has resigned his position with that company to become factory representative for the Edison Electric Appliance Company covering central and northern California, with headquarters in San Francisco. J. J. Burns has been given charge of the territory south of San Francisco.

Obituary

W. J. Santmyer, for the past twenty-seven years connected with the Puget Sound Power & Light Company, Seattle, died in Rochester, Minn., Jan. 24, after a short illness.

TRADE NOTES

The Bluebird Electric Shop, 1105 Broadway, Tacoma, Wash., has been appointed exclusive distributor in that territory for the Electro-Kold Corporation.

Rome Wire Company, Rome, N. Y., has issued an illustrated 42-page booklet on bare copper wire. The various types of wire are described fully and extensive tables are given in the booklet.

The Pyle-National Company, Chicago, claims a new type of floodlight projector in its No. 2375. Ventilation has been dispensed with entirely and the cast-aluminum alloy case has an absolutely tight closure, with machined surfaces at the door joints and a soft lead packing ring, a drawn aluminum back and fittings and small parts of aluminum or bronze, according to the manufacturers.

The Ideal Electric & Manufacturing Company, Mansfield, Ohio, has brought out recently a new line of motors called the "Flywheel Type" and is now in a position to furnish this machine as engine type alternator. This type of alternator construction creates a self-contained power unit, being an integral part of the engine and occupying less space than the old design.

Electrical Products Corporation, Los Angeles, recently has issued bulletins Nos. 20 and 21. The former presents the latest designs in stage lighting, footlights, border lights and strips. Illustrations and price lists are given. Bulletin 21 covers interior theater lighting.

Ohio Brass Company, Mansfield, Ohio, has developed a new metal which it has called "Flecto" iron. This is a type of malleable iron which by virtue of a heat-treating process, is freed from all tendency toward embrittlement when hot-dip galvanized. While retaining all of the desirable characteristics of malleable iron, it is claimed the Flecto process so improves the metal with added valuable properties that it is considered to be practically a new metal.

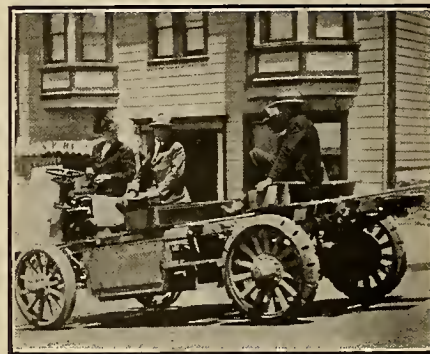
Willamette Iron & Steel Works, Portland, Ore., now are manufacturing and distributing the Jones-Willamette bearing, which possesses the dual features of automatic circulation and filtration of oil. The bearings are manufactured in all styles—flat bottom, internal collar, drop hanger, rigid post, bell and socket, and various other types for special purposes. A descriptive bulletin is available.

Eddings Electric Store of 652 Honolulu Avenue, Montrose, Calif., has found it necessary to move into larger quarters and has taken store space in a new building at 633 Honolulu Avenue, into which he will move his stock of appliances, radio and other goods at once.

The Foxboro Company, Inc., Foxboro, Mass., has moved its Pittsburgh office from the Park Building to the Foxboro Building, Sixth Avenue and Grant Street. H. S. Gray will continue to be in charge of the Pittsburgh branch.

Manchester Electric Company recently opened an electric fixture and supply store at 8501 S. San Pedro Street, Los Angeles. The proprietors, V. Dionne and W. G. Potter, have purchased the business formerly owned by Birkel & Merigold of W. 7th Street. They will specialize in fixtures and appliances as well as radio.

The San Pedro Electric Company, 263 W. 6th Street, San Pedro, Calif., has found it necessary to remodel its entire store to accommodate its appliance display. Special wall cabinets and removed partitions allow greater floor space as well as radio demonstrating room.



During the P.C.E.A.'s electric truck school in San Francisco last June the Commercial Truck Company made some demonstrations on some of the city's well-known hills as part of the course of study. The accompanying picture shows John D. Scott, commercial engineer, Portland Electric Power Company, Portland, (behind the driver) enjoying a demonstration on Telegraph Hill. The driver is William Hutton, sales engineer, Commercial Truck Company, San Francisco, while on the rear seat are William Otis, publisher, "Western Truck Owner," San Francisco, and H. E. Cowgill, distributor, Commercial Truck Company, Portland.

Lee B. Mettler Company, Los Angeles, Calif., has issued a condensed catalog in unique form. It is printed on both sides of a single sheet of heavy pressboard, 10 x 11½ in. in size to fit the standard letter file, with projecting letter tab. Mr. Mettler calls this simplified method of cataloging, "the Mettler advertising system and file card therefor," and is attempting to get every original manufacturer in the United States to present his product in the same way because of the advantages resulting from the simplification. Patent covering the system has been applied for.

The Wagner Electric Corporation has moved its Omaha office to 2566 Leavenworth Street in that city.

General Electric Company, Schenectady, N. Y., in its 43-page bulletin No. GEA-10, fully describes and illustrates its various types of mechanically operated flow meters for measuring fluids and gases. Diagrams and tables, together with price lists, are included in the booklet.

H. E. Williamson & Company, manufacturers of the "California Maid" electric clothes-washing machine, have moved to 425 Fourth Street, San Francisco.

Savage Arms Corporation, Utica, N. Y., has designed and developed the Savage All-Electric Ironer with the forearm typewriter touch control. All the interesting features are described and illustrated in the folder just issued by the company.

Gainaday Electric Company, Pittsburgh, Pa., has perfected an advertising and publicity plan whereby through an arrangement with the Universal Picture Corporation all Gainaday dealers may tie in their Gainaday publicity with the "Little Giant" motion picture, when shown in their respective cities. The picture is built around an electric washing machine. A folder containing advertising and merchandising suggestions in connection with this plan has been issued by the company.

Condit Electrical Manufacturing Corporation, Boston, has issued a reprint of the paper presented by George A. Burnham at the Philadelphia convention of the Association of Iron and Steel Electrical Engineers. The purpose of the paper, which covers "The Selection and Maintenance of Oil Circuit Breakers," is to bring out for discussion the fundamental factors which should be given careful consideration in the selection of control and protective devices in heavy industrial service. The paper is illustrated with drawings and photographs.

The Griscom-Russell Company, New York City, has removed its general offices from 90 West Street to the new Murray Hill Building, 285 Madison Avenue, that city.

The Mills Electric Company, 326 Pine Avenue, Long Beach, Calif., is preparing to move into a new store at 436 Pine Avenue. H. E. Mills, the proprietor, states that he will add a radio department in the new store, which will be much larger than the present one.

The Allen-Bradley Company, Milwaukee, manufacturers of electric controlling apparatus, has published recently a bulletin on its type F-2250 crane, hoist and mill controller for general crane and mill service.

The Wesco Company, Inc., manufacturers' agent in Denver, has been assigned the accounts of the National Metal Molding Company and the Pittsburgh Reflector Company. O. P. Wiloughby, president of the company, recently returned from an extended Eastern trip, and will shortly announce the procuring of additional representative lines.

The Ward Leonard Electric Company, Mount Vernon, N. Y., now is building its Vitrohm circular-plate generator and motor-field rheostats with pressed-steel instead of cast-iron plates. The new design permits lighter and much stronger plate to be supplied for the same duty.

The Servel Corporation has opened district offices in Denver at 924 Gas & Electric Building under the direction of Harold Smethills.

J. G. Pomeroy Company, of Los Angeles and San Francisco, has been appointed Pacific Coast representative for the Erie Malleable Iron Company of Erie, Pa., manufacturers of Kondu fittings.

Journal of Electricity

Devoted to the Economic Production and Commercial Application of Electricity
IN THE ELEVEN WESTERN STATES



FRIGIDAIRE has produced six new models built complete with metal cabinets. They are finished in white Duco and insulated with solid corkboard. Five of them are trimmed with bright metal and lined with seamless, porcelain-enameled steel.

To the public utility company, these new metal cabinet Frigidaires offer a sales opportunity greater than ever before. They offer a greatly increased line, new low prices, the opportunity for establishing thousands of new current outlets due to a vast widening of the field for electric refrigeration.

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Journal of Electricity

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IN THE ELEVEN WESTERN STATES

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Shoulders to the Red Seal Wheel!

WHILE it has taken many weeks, if not months, in which to complete the state-wide organization for the promotion of the Red Seal plan in California, the results that already have commenced to accrue have demonstrated the value of preparedness. Red Seal manuals, together with job cards and other printed forms, were in the hands of all of the twenty-five state divisions the latter part of February. On the day that this was written, March 9, more than fifty Red Seal homes were under way in California, and the first twelve owners' certificates demonstrating that the Red Seal plans had been carried through to completion were signed on March 8.

The California Electrical Bureau has set for itself an arbitrary bogey of 2,000 Red Seal homes during 1926. The first two months of the year having been spent in perfecting the details of the organization, it really means a ten-months period for work and that an average of fifty homes per week will have to be maintained in order to make good on this program.

When the benefits to be derived by every branch of the industry through these 2,000 homes, which otherwise in all probability would not have been adequately wired to permit of the full use of electrical household service, are taken into consideration it would seem that every member of the industry should put his shoulder to the wheel and carry the plan on to a successful conclusion. Certainly from the enthusiastic way in which the districts are organizing it would seem that 2,000 homes will represent a minimum rather than a maximum achievement.

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Makers of DURABILT Products

EDITORIAL

Electrical Estimators Organize to Study Evils of Contracting Business

HAPHAZARD methods of estimating quantities of materials and the labor necessary to install these materials properly long has been recognized as one of the greatest evils in the electrical contracting business. Having as its object the elimination or mitigation of this condition, an organization known as the Estimators' Section, California Electragists, Southern Division, has been formed by the electrical estimators of Los Angeles and vicinity, as described elsewhere in this issue.

The studies of this organization will include comparative time studies, methods of correctly estimating quantities of material, and study of life and fire hazards of the industry. These studies should result in the securing of valuable data for members of the organization and be an aid in establishing the business of electrical contracting on a much firmer basis. The progress of the organization will be watched with interest by the electrical industry.

Better Public Relations Via the Open-Door Policy

NO worthier step could be taken by all of the electrical utilities than that which has been taken by a few in opening up their power houses, substations and other properties and inviting the passing public to come in and see how electricity is made and handled. There is a wide difference in the reaction caused by the grim and forbidding "Keep Out" and that caused by the pleasant "Visitors Welcome" so far as the passing public is concerned. The first is a contradiction of the policy of frank and open dealing while the latter is fully in synchronism with the genuine spirit of sincerity of which the utilities today like to boast.

The operator's time is in no wise so valuable but that a portion might be well spent in piloting the local banker, housewife or farmer to the points of interest in his station. It will increase his pride in the appearance of his station and it will satisfy a longing on the part of the visitors to see how electricity is handled. Experience has shown that no great deluge of visitors need be feared.

This open-door policy in public relations is entirely in harmony with the other phases of public-utility business. For years the books and accounts of the companies have been open to the public through the public-service commissions. Now the utilities themselves see the benefits of inviting the public to visit their properties and become acquainted with the machinery which furnishes them light, heat and power.

Central Stations Must Devote More Time to Sales Departments

NATIONAL prosperity cannot help but be reflected by the central stations of the country. If business generally prospers, so will the power companies for they are an essential part of the economic structure of the nation. On the other hand, general prosperity creates a highly competitive market so far as the public is concerned. If Mr. Average Citizen has plenty of money in his pockets to spend, business will show him where to spend it. Moreover, the competition to get some of his surplus will be keen. Witness the highly developed sales methods of the automobile, the radio and other industries. That the public is spending is evident from the success these industries are enjoying at the present time.

In this competitive market brought about by general prosperity the central-station commercial departments should take an active part. If the public has money to spend, the electrical industry should induce it to purchase electric ranges, refrigerators, washing machines, vacuum cleaners and other appliances which will add to the comfort and conveniences of living. To do this will require highly developed selling methods with salesmen of the highest type and sales executives of the finest caliber. The central station must set the pace. They must devote more time and attention to the sales end of their business. They must establish sound merchandising policies. They must advertise and, above all, they must SELL.

Enlisting the Support of Those Related to the Industry by Blood or Marriage

HOW much does your wife know about your business? How much do you think she should know? If she knew more than she does, could she be of any help to you or to the electrical industry? In asking and answering these questions on another page of this issue the wife of the vice-president and general manager of one of the principal utilities in the Northwest has issued a challenge to all utility men.

During the past two years there has been a definite realization on the part of central-station executives of the part women employees can play in increasing good will and in promoting the use of appliances. This realization has been reflected in the organization of Women's Committees on Public Information in all of the N.E.L.A. geographic divisions and in many of the larger utility companies. Their work has been eminently successful.

Now this author urges the utilities to go one step further and introduce the wives as a factor in promoting the welfare of the companies. She argues that, since the women related to the companies directly through a monthly pay check have done so much good, those related by blood or marriage could wield a powerful influence in gaining the comprehension of women voters and citizens for the problems and services of the utilities.

It will remain for the men to take the first step. They might do this by showing the article in question to their wives. This seems to be a justifiable case when the "better half" of the family might read her husband's trade journal. Should a wife read this material we would welcome an expression of opinion from her.

Industry Needs More Information About Radio Interference

RADIO offers both problems and profits to the power companies. The problems, and they are many, are based largely upon interference between power and distribution circuits and radio receiving sets. The profits are derived from increased consumption of electricity both for lighting and for battery charging or operation of the newer type lamp-socket sets. There is still another benefit which is linked closely with the question of interference. It is the accumulation of good will that will come when the public is made to realize that the power companies are exerting every effort to eliminate the squeals, howls and buzzes which are traceable to their lines and equipment.

On another page of this issue is a discussion of interference between power circuits and equipment and radio receivers. The author has summed up many points which have been brought out in recent discussions of the subject and has added thereto some results from personal investigations. It is a most thorough and complete discussion of this fairly new subject. The writer makes one suggestion that should be of interest to power companies in general. He suggests that both time and expense might be saved if a questionnaire were prepared which could be sent to a consumer immediately upon the receipt of a radio complaint. Such a questionnaire conceivably might suggest various tests to be applied to the set before again notifying the power company that the disturbing noise persists. Upon receipt of a second complaint a trouble man could investigate.

The industry needs more discussion of problems of radio interference and a greater interchange of the results of investigations. By following such a course remedies can be developed more quickly and all companies benefit from the experiences of others.

Red Seal Plan Needs Advertising Support

THE work of organizing the state of California for the prosecution of the Red Seal plan is well under way. The formality of the execution of the licenses for the twenty-five dis-

tricts into which the state has been divided is complete. Manuals and the various report blanks and application forms covering in general the paper work of the plan have been delivered to all district chairmen. Soon the list of Red Seal homes in California will begin to grow, it is to be hoped in an increasing degree, as the plan becomes more widely known and its advantages to the home-owner become more apparent.

The publicity work in this connection is a serious problem. Since the Bureau has barely sufficient funds available to cover cost of administration, it is obvious that anything remotely approaching a comprehensive statewide advertising plan of paid advertising space with Bureau funds is out of the question. The advertising committee, therefore, has formulated a scheme for making the best possible use of such means of publicity as are already in existence. It is proposed to enlist the support of all the power companies in the state, by which a certain amount of space in their house organs will be allocated to the Red Seal plan. This in itself will carry the message into the homes of nearly a million electrical consumers. It is proposed further that all members of the industry, including every branch and section, will be urged to carry at least a Red Seal slogan in all of their own newspaper publicity plus, if possible, direct appeals for the institution of the Red Seal plan that the advertiser will tie himself in with as an exponent of what the Red Seal stands for, namely, a system of house-wiring adequate to permit the convenient use of domestic electric appliances.

Truly it is a task of no small magnitude to organize so large a state as California and provide the machinery for carrying out a promotion effort of this nature. It has taken many months of hard work on the part of those entrusted with this responsibility, and it is gratifying in the extreme to the industry as a whole to know that a really enthusiastic response has taken place in every section. It is not too much to say that this is the greatest movement for the benefit of the industry and those whom it serves that has taken place for many years. Its effect is bound to be far-reaching, and the whole-hearted support of everybody in the industry will be necessary for its complete success.

DISCUSSION

The Cost of Power from San Francisco's Municipal Plant

To the Editor:

Sir—Despite the city engineer's estimate that \$21,000,000 of the expenditures by San Francisco on its Hetch Hetchy power and water supply project should be charged to power development, the Board of Supervisors has placed a temporary estimate of only \$9,000,000 on the capital invested in

this power development. It is understood that this estimate is intended only for use in segregating funds during the current fiscal year and is not to be taken as the final statement of capital charges. Will such action change the facts or mislead anyone? It gives the impression that the cost of the power is to be made to appear relatively low. Is this in accord with the facts? The city authorities elected, without effective protest from any source, to expend for quite a different project the funds with which a water-supply project under the Garfield permit was to have been constructed.

Instead of the proposed progressive development of a water-supply project as authorized by the bond election in 1910, of which the first unit could have been completed in three to five years, well within the limits of funds provided for the purpose, large-scale power and water development has been made in the program.

The Hetch Hetchy dam was built, including as an accessory many miles of costly mountain railway. This dam was not a feature of the Garfield-permit project. The 18-mile tunnel through the mountain from the Early Intake on Tuolumne River to Priests at the forebay of the Moccasin Creek power station, to carry 400,000,000 gallons of water per day (about 600 sec. ft.) has been constructed as also the Moccasin Creek power station and the transmission line to the new substation at Newark. In addition to the power plant and storage on the Tuolumne River at Hetch Hetchy, storage works also have been completed at Lake Eleanor and about \$6,000,000 have been invested in a pipe line across the Santa Clara Valley to be used temporarily by the Spring Valley Water Company for the delivery of water caught in its Calaveras Reservoir. The construction of these elements of the present municipal project have exhausted the funds made available by the early bond issues, leaving the foothill tunnel in the Sierra Nevada, a pipe conduit across the San Joaquin Valley and the tunnel, over 30 miles long, through the Coast Range from the San Joaquin Valley to the Santa Clara Valley, as the larger of the project features, yet to be provided. Of these features the tunnel is the one which will determine the time when the delivery of mountain water can begin.

This proposed tunnel on which initial expenditures, largely in the nature of exploration, are about to be made was not a part of the Garfield-permit project. This earlier project called for a first unit, with a pipe line across the Coast Range at Altamont Pass, of a capacity of 60,000,000 gallons per day. Under this original project there could have been provided within a few years an amount of Tuolumne River water about 50 per cent greater than the present delivery of the Spring Valley Water Company and there would have been thus assured to the city, including present sources, an early aggregate dependable supply of 100,000,000 gallons of water per day or enough for about twice the present population of San Francisco. But this program of progressive development has been abandoned. Instead of having this supply delivered into nearby reservoirs and actually available within a

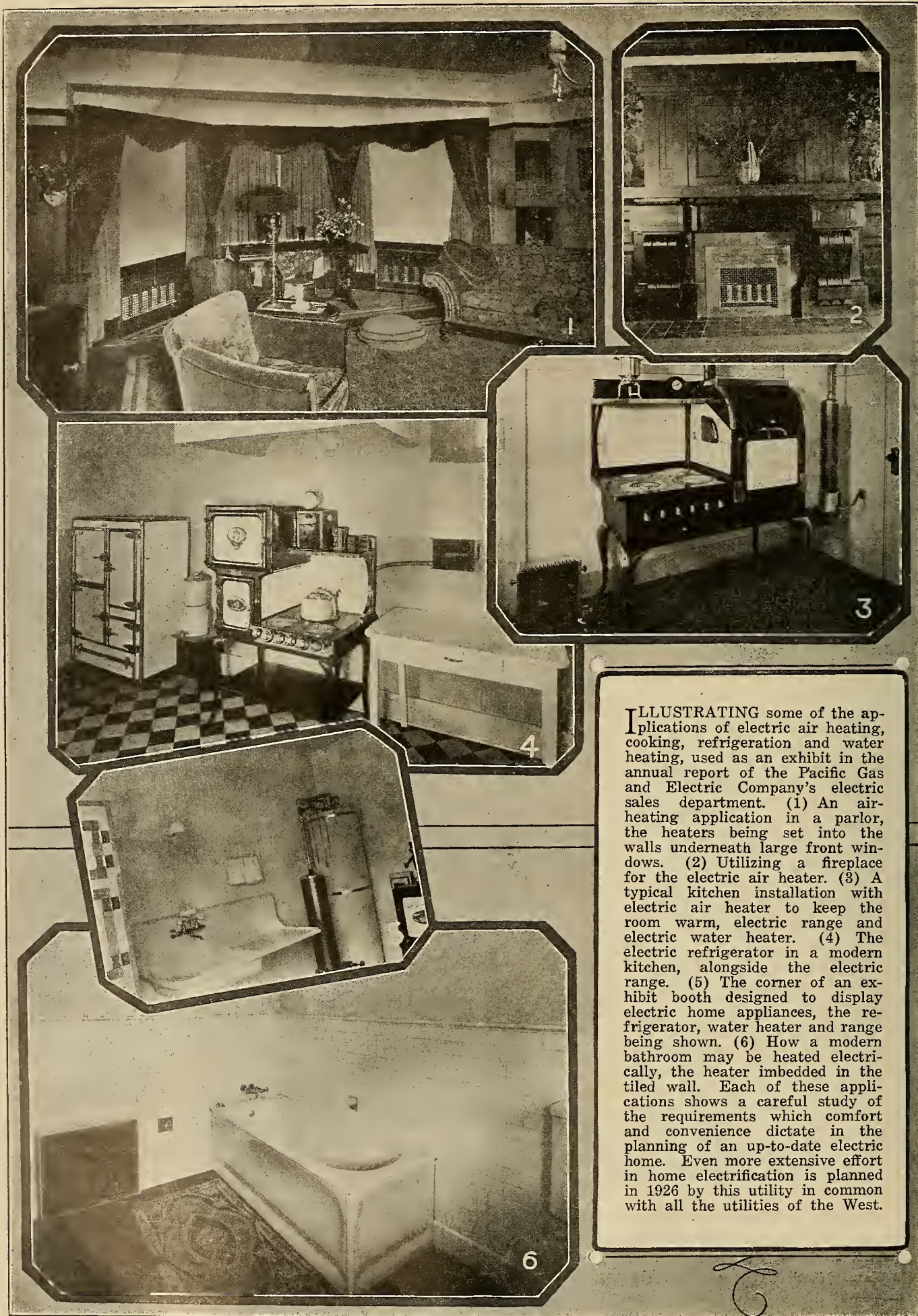
few years after the commencement of construction, the delivery into the Bay region of Tuolumne River water, after some ten years of construction work, is still far in the future. To what is the change in policy to be ascribed if not to a misdirected attempt to bring in cheap power?

And, now, what is the administration trying to do? The people now are expected to accept the fiction of a realization of this cheap power dream. May not the question be put as to whether cheap water is not as important—even more so—than cheap power? Why fool ourselves? Are not the costs due to postponement of the possible realization of a water supply chargeable to the power-development program? Should not the \$10,000,000, more or less, already paid by the taxpayers in their annual budgets for interest during construction be taken into account, and, in the main, allotted to the investment for power? Should not the costs involved in the premature expenditure for a Hetch Hetchy dam be charged to the power account? Should not the premature investment in the expensive Sierra Nevada tunnel be taken into account in determining what power production is costing San Francisco? Should not the inconvenience, too, and the repeated menaces of water shortage be charged up to the power feature of the city's water project? Or, if not, what, may well be asked, will the cost of the Tuolumne River water when the first of it makes its appearance, perhaps ten years from now?

The demand for water upon completion of the conduit will not jump at once to the capacity of the conduit units. Even if it did, the high cost of the water, all cost factors taken into account, would astound the rate-payer and yet either the rate-payer must bear the burden or it will fall on the taxpayer. There is no escape. A few figures will give some idea of the city's project as it looks today. The gross income from power sales is said to be about \$2,000,000 per annum. Operation and depreciation are, it is believed, costing about \$350,000 per annum. Interest on about \$60,000,000, of present-day investment, including outstanding and redeemed water bonds, and interest already paid, together with all other past expenditures for investigation and preliminaries of all kinds, can be placed at about \$2,700,000 per annum. The opportunity which the city has created to enjoy a revenue from the sale of power therefore appears to be costing the taxpayers at present about \$1,000,000 per annum with a prospect that this annual sacrifice, growing with each new sale of bonds, will continue some ten years longer. The future question, therefore, presents itself as to why this deficit, resulting as it does from a diversion of funds to power development and consequent delay in completion of the water project, should not be charged in large part to the cost of the power output. What, then, is the real cost of this power output now and prospective?

C. E. GRUNSKY,
Consulting Engineer.

San Francisco, Calif.,
February, 1926.



ILLUSTRATING some of the applications of electric air heating, cooking, refrigeration and water heating, used as an exhibit in the annual report of the Pacific Gas and Electric Company's electric sales department. (1) An air-heating application in a parlor, the heaters being set into the walls underneath large front windows. (2) Utilizing a fireplace for the electric air heater. (3) A typical kitchen installation with electric air heater to keep the room warm, electric range and electric water heater. (4) The electric refrigerator in a modern kitchen, alongside the electric range. (5) The corner of an exhibit booth designed to display electric home appliances, the refrigerator, water heater and range being shown. (6) How a modern bathroom may be heated electrically, the heater imbedded in the tiled wall. Each of these applications shows a careful study of the requirements which comfort and convenience dictate in the planning of an up-to-date electric home. Even more extensive effort in home electrification is planned in 1926 by this utility in common with all the utilities of the West.

The Pacific Gas and Electric Company's \$2,000,000 1925 Sales Campaign

By R. E. Fisher

Vice-president in Charge of Public Relations and Sales

SINCE it is upon a trend of generally increasing sales that all other phases of a central station's activities today are predicated, from its technical advancements on through the gamut to public relations and that all-important question of maintaining a normal rate schedule, it is well to consider the large part which sales efforts have played in the program of the Pacific Gas and Electric Company for 1925.

Briefly, the results achieved were as follows: isolated plant sales activities resulted in converting 2,836 kw. of load to the use of the company's energy.

The electric range, water heating, air heating, commercial cooking and electric refrigeration sales activities resulted in adding 27,234 kw. of load to the lines.

Kitchen-lighting units, lamps, commercial and industrial lighting, and street-lighting sales activities resulted in adding a connected load of 6,212 kw. to the lines.

Other miscellaneous sales efforts, largely of a creative nature, resulted in adding a connected load of 48,371 kw. This makes a grand total of 84,893 kw. of connected load signed in 1925.

This was in spite of a reduction in sales to outside corporations, mining load and pumping loads, due to plentiful rains. These decreases were more than offset, however, by increased sales to lighting, heating, cooking, and manufacturing power consumers, a load which brought higher revenue per kilowatt-hour than the load which was lost.

This is borne out in the fact that the company increased its revenue in higher rate fields about \$2,026,000 and decreased its revenue in the lower rate fields approximately \$606,000. Consequently, by the shift in kilowatt-hour sales from the lower average revenue classes of business and with only a slight increase in over-all sales, the company made an increase in gross of approximately \$1,420,000. This is an exceptional showing, and one which is gratifying as well as interesting.

The year 1925, from an electric sales angle, was the most successful one in the history of the Pa-

UNDOUBTEDLY one of the most constructive sales plans, built on sound merchandising foundations, is that of this California utility company. It took into consideration the public, the contractor-dealer, the jobber, the manufacturer, the furniture dealer, as well as the company. Although started only last summer, the results obtained under it already have demonstrated its effectiveness and structural soundness.

cific Gas and Electric Company. This was made possible, first by having a sound working plan; second, because the company had an abundant supply of its commodity to sell, and last because of the faith the company reposed in its sales department in its approval of expenses involved in carrying into execution the sales plans.

The year's sales work through circumstances was divided into two parts. The first division was that from January to June, in

which only ordinary sales efforts were carried on. The second division was from July onward, when sales activities were intensified because of the completion of the company's new hydro plants as well as other factors which gave the company a surplus of power available for sale, necessitating an increased sales force to dispose of it.

Electric sales plans, in accordance with their importance, covered activities in the following fields: illumination, appliances, industrial heating, isolated plants, commercial cooking and electric trucks, in each of which a concerted sales effort was made and for each of which results of a very gratifying nature have been recorded.

Lighting Sales Especially Productive

Illumination sales, accompanied by their high revenue per kilowatt-hour, accomplished a most unusual record. The company planned to place 20,000 kitchen lighting units in the homes of its consumers through house-to-house campaign, the hardest kind of selling. The year's close showed that quota reached in the fourth month of the sales campaign, and that the total number sold was 31,970 or 50 per cent over the quota. Considering that each unit brings a revenue of approximately \$2 per year to the company and that the sale of these units was self-supporting, the electric sales department may be considered to have accomplished a wonderful piece of work.

The total connected load added through kitchen-lighting unit sales and other branches of illumination sales effort, including lamp sales, commercial and industrial lighting, sign lighting, and street

and highway lighting was 6,212 kw., with a resultant estimated annual revenue of \$377,741 to the company.

Under the major sales plan, augmented from the ordinary sales effort of the first six months of the

Good results were accomplished in the field of commercial industrial lighting sales because of the growing appreciation of the value of light on the part of merchants and manufacturing interests. The commercial lighting campaign started in August. A training school was conducted in Oakland, in which eight salesmen were instructed. As time went on additional salesmen were added and distributed among the divisions where their work would be most effective. During August and September commercial lighting demonstrations were carried on before ten San Francisco business men's associations, 250 merchants attending. These were conducted by Mr. Frank Smith and were received with great interest on the part of the merchants.

Of outstanding interest in commercial lighting are the window-lighting installations of the Pacific Gas and Electric Company at 445 and 447 Sutter Street, and also in the Marysville office. These created a great amount of interest on the part of observing merchants and also on the part of those merchants whose merchandise was displayed for them in these window displays.

Lighting salesmen co-operated with architects, builders and contractors and now their advice and services are being sought after. A "Better Lighting League" has been formed in San Jose, which has been inspired and fostered by the division sales department. This has the support of representatives from prominent business firms. The purpose of the league is to build up the business streets and districts through better lighted stores, windows, signs and street illumination. Much success has attended these efforts.

Numerous floodlighting installations have been made, notably in Oakland, San Francisco, San Jose, North Bay and Colgate divisions.

In co-operation with five of the principal electric-sign manufacturers in the Bay district, the company's salesmen have assisted in the installation of many new electric signs. The sign companies that are the most active are well pleased with the results accomplished. Plans for 1926 along these lines are for still more extended effort and service on the part of the company.

Street-lighting has had a heavy growth during 1925, as indicated from the statistical department's records, which show that the kilowatt-hour increase for the first eleven months of 1925 amounted to 15.4 per cent over the corresponding period in 1924. Sales effort for increased street-lighting load has been carried on mostly through divisional sales organizations. Outstanding increased street-lighting loads have occurred in San Francisco and East Bay divisions. New electrolier installations have been made in Corning, Sebastopol and San Francisco. A few highway-lighting installations have been made in San Jose and North Bay divisions.

The Industrial Lighting Campaign of the National Electric Light Association, September 1925 to March 1926, is in progress at this time. It coincides with the company's own industrial lighting

DAYLIGHT YOUR KITCHEN

Special Offer

NO PAYMENT DOWN



The kitchen is the work-shop of the home—if good lighting is needed anywhere, it is there.

So, after a great deal of experimenting, we present to you the ideal light—

The Daylight Kitchen Unit

—it floods the room with light, even into the oven. No shadows on your work, at the sink, the stove or the table. It's a pleasure to work in a daylighted kitchen. You cannot know the difference until you try it.

We Make This Special Offer

—because we are so sure you will be pleased with this unit. We will remove your old fixture and install the new one. You pay absolutely nothing—set one penny—when the light is installed. Enjoy this better lighting and pay us for the unit on easy monthly payments of 75 cents.

This is a Special Offer for a Limited Time Only!

PACIFIC GAS AND ELECTRIC COMPANY
P.G. and E.
"PACIFIC SERVICE"

In the kitchen-lighting unit campaign this broadside was used.

year, the first important problem was to increase the lighting sales force from two and a half men to 95 men. This was accomplished through the co-operation of the personnel department and division sales departments. Very few men available were experienced lighting salesmen, and it was therefore necessary to organize and train this force.

In preparation for home-lighting, sales schools were conducted over a three-day period in San Francisco, Oakland and Sacramento in which 82 salesmen were instructed. The subjects covered were: Electricity in the Home, Public Relations, Customers' Service and Complaints, Salesmen's Duties, Sales Lamp Service, Portable Lamps in the Home, and a visit to an electrical home.

The educational phase of lamp-selling to homes was stressed, particularly as to quality and quantity of light, use of lamps of correct voltage, etc. Many favorable comments from customers to salesmen were heard concerning this service.

In the kitchen-lighting unit sales, the following sales data may be of interest:

Ratio of sales to interviews granted.....	1 to 4½
Ratio of sales to actual contacts.....	1 to 9
Total estimated contacts with residential lighting customers	270,000
Maximum kitchen-lighting unit sales per man per day	40
Average sales per man per month.....	125

campaign and it is therefore deriving benefit from the national advertising.

Major Appliance Sales Active

Appliances of a major character were sold throughout the entire territory served by the company. Electric-range sales added 21,380 kw.; air heating added 10,939 kw.; water heating added 6,009 kw.; and refrigeration and miscellaneous equipment added 546 kw., giving a total added load of 38,875 kw. It is estimated that this will increase the company's revenue by \$402,414.

Under the ordinary sales efforts of the first part of the year 1,162 ranges, 467 water heaters, 1,819 kw. of air heating, and 1,067 kw. of commercial cooking and heating were sold, increasing the yearly kilowatt-hour consumption by 4,935,600. For the latter half of the year, under the augmented sales plan, even better results were obtained. There were sold 1,869 ranges, 795 water heaters, 7,172.4 kw. of domestic air heating, 1,947.7 of commercial air heating 1,772.0 kw. of commercial cooking, and 265.7 kw. of hotplates, a total kilowatt-hour consumption of 11,655,930.

The fall and winter months being heating months, the company was able to sell electric heating and commercial cooking and heating far in excess of its quotas. This type of load should be very attractive to a company since it provides a high load factor during winter months and offsets the summer agricultural peak by filling the winter "valley." Moreover, it brings \$10 per year revenue per connected kilowatt, besides providing a large diversity factor. The revenue per kilowatt of demand is high. Besides it is a load which comes at a season at which there is plentiful water for hydro power. Another factor entering into the matter is that dealers are active in fostering air-heater sales.

The 1925 Sales Plan

Reference has been made to the 1925 sales plan for electric-range, water and air-heater sales in its augmented form, beginning in July of 1925 and completing the year. Briefly outlined the scope and method of that plan, which was designated as Plan 4, may be of interest. The magnitude of the plan and the limited period of its operation necessitated that it be placed before the whole industry in the shortest space of time possible.

To get the idea over as effectively as possible, the following plan had been devised previously and was placed immediately in effect upon the authorization of the entire plan:

A. Employee meetings were held to sell employees on the plan.

B. Dealer meetings were held through development leagues to explain the plan.

C. Jobber salesmen and manufacturers' employees were explained the plan and shown where they could tie in most effectively with it.

D. Furniture dealers' meetings were held, in

which was explained the plan and the part they could play in it.

Eighteen meetings were held from July 7 to 23 with dealer organizations and employees, at which approximately 1,100 were addressed on the sales

Now

ELECTRIC RANGES—

the Opportunity You've Been Awaiting!

THE leisure enjoyed by happy, modern housewives daily testifies to the many advantages and attractive features of the newer electric ranges. Literally hundreds are being sold to our customers each month—so popular are these electric ranges.

This offer is for a limited time only!

Attractive Low Prices

Special Low Rates For Electric Cooking and Heating

Essential lines to choose from. Latest Models.

All Wiring Complete. Electric Stoves for cash.

ONLY 10% DOWN Balance in Easy Monthly Payments

What the Users Say?

"Speed"
"Economy"
"Freedom from hot kitchen"
"Less work and worry"

"Spacious oven cooking"
"Long life"
"The electric range is all that a good cook needs"

See the display at our office or at your dealer.

PACIFIC GAS AND ELECTRIC COMPANY
P.G. and E.
"PACIFIC SERVICE"

Facsimile of broadside used in the range campaign.

plan. Other meetings with jobbers, at which 225 attended, with furniture dealers at which 100 attended, and endorsement by all electric leagues, soon placed the plan in operation.

The personnel department of the company co-operated to the fullest extent with the sales organization in selection, hiring, transferring and promotion of salesmen. The company was fortunate inasmuch as it had trained salesmen in nearly every division who were responsible for the training of new salesmen. A two-day training school was held in Marysville for all salesmen in the Sacramento Valley. Fourteen salesmen attended and were addressed by various manufacturers' representatives upon their appliances and how to sell them. Public relations, rates, the extension policy and company policies also were discussed. During August and September meetings of the company's employees were held in Colgate, East Bay, North Bay, San Jose and San Francisco divisions, 840 attending these meetings, each of which was considered very successful from the point of creating interest and co-operation on the part of all employees with the sales department.

Besides these, many demonstrations were held at fairs, schools, farm centers, and dealers' stores in all divisions. Six major cooking schools were conducted at Marysville, Corning, Santa Rosa, San Jose, Woodland and Chico, each conducted as a "Newspaper Free Cooking School." These schools met with great success. From publicity alone these schools were more than justified. They were of assistance in breaking down the opinion that elec-

tric ranges are seasonal appliances, and the good accomplished will extend far over the period of a year.

The Furniture Advertising Discount

The fact that people buying home furnishings from furniture stores also buy most of their kitchen equipment from the same firms led to the creation of a special advertising discount. Such furniture stores were not displaying nor making any attempt to sell electric ranges. The company wanted to get electric ranges on their floors and have them sell them. Realizing that it would be a rather slow development, it was felt that the company was justified, nevertheless, in starting such stores on a movement that would gradually build them up in the electric-range business. Inasmuch as salesmen from such firms knew little or nothing about electric ranges, a training school of eight evening classes each was held in both San Francisco and the East Bay district.

Twenty-five furniture firms qualified for the quantity discount, and while their sales have been a small percentage of the company's gross sales, it is felt that the company reached the mark it expected and that its efforts in this field have been justified.

The sales of electric ranges, water heaters, air heaters and commercial cooking have been gratifying. After five months of practical applications and contact with men in all walks of the industry and consumers the company is convinced that the sales plan was all it believed it to be and more. It will go down in merchandising history as the most constructive sales plan built on a sound merchandising foundation that has ever been put into effect by a public utility, due to the fact that it took into consideration the public, the contractor-dealer, the jobber, the manufacturer, and the furniture dealer as well as the company. The period covered by Sales Plan 4 may best be thought of as a period of organization, training and enlargement of a sales organization. Considering the short space of time in which it was accomplished, it is felt that the results were very satisfactory. What was accomplished was done without the use of any high-pressure sales methods, making the company very effective from a public-relations standpoint.

Electric Industrial Heating

Industrial heating sales effort resulted in the addition of 2,404 kw., which will bring in an added revenue of \$96,160 per year, an accomplishment of which the sales force feels reasonably proud.

It is interesting to know that the industrial electric sales for 1925 were in excess of four times the sales of 1924. During the early part of the year, with only one man devoting his time to industrial heating and one man part time from the general office, only 210 kw. of new load was secured; but for the latter half of the year under Sales Plan 4, with the average full time of three men and one man half time in the divisions and full time of one man in the general office, 2,194 kw. of new industrial heating load was secured. The cost per kilowatt to secure the 2,194 kw. during

the last six months of the year amounted to \$2.51. This represents an annual revenue of approximately \$16 for each dollar of sales expense.

Isolated Plants Converted to Electricity

During 1925 the electric sales department's records show that on isolated plants 3,448 kw. were added, with a resultant annual revenue of \$41,376. This branch of the sales work has had as its main object the closing down of all oil, steam and gasoline-driven engines that could be served equally well or better by electric power.

The next activity was on commercial cooking sales. This consisted of the sale of small appliances mainly, such as waffle irons, toasters, grills, broilers and bake ovens. The result was that 2,839 kw. were added to the company's lines, and it is estimated that an annual revenue of \$35,478 will result.

Electric Transportation Assisted

The last classification of the sales work covered electric transportation sales. The results were very encouraging although the company's efforts are not strictly capable of being tabulated, since the company itself makes no direct sale of either the street or industrial trucks. However, 45 trucks were added in 1925, and a most interesting fact is that these users of electric trucks are repeating their orders and a good percentage of new users has resulted. The 45 trucks which were added bring an off-peak load of 225 kw. and an estimated annual revenue of \$6,750.

The electric-truck activity of this company for the past year has been in the nature of co-operating with the members of the Electric Transportation Association, whose outstanding accomplishments have been in having enacted by the state legislature a bill relative to the license tax on electric trucks that has resulted in a saving of \$8,000 to electric truck-users in the state this last year; the inaugurating of a co-operative advertising program in three of the trade journals; the holding of an electric-truck school in San Francisco, and an electric-truck parade in connection with the N.E.L.A. convention.

Research Department's Accomplishments.

In conclusion it might be added that during 1925, in addition to the activities which can be tabulated directly and results accounted for, the electric sales department utilized its research department in making special reports on: (1) waste heat utilization in cement plants versus purchased power, (2) generated versus purchased power for the Red Star Laundry at San Jose, (3) cost of power generation and segregation cost, Mare Island Navy Yard. Many other reports were made, and in practically every case the isolated plant was shut down, or where the erection of an isolated plant was contemplated, the idea was abandoned and electric power used.

It is also of interest to know that the proportion of each dollar of revenue for 1925 which was expended for sales activities in the electric department was only \$.0132.

Should the Wives of Utility Employees Take an Interest in the Business ?

By Mrs. Lewis A. McArthur
Portland, Ore.

MEN no longer ask whether or not women should be employed in business positions, yet many men still are reluctant to admit that women as wives ought to know any more about business in general or their husbands' own business in particular than those husbands happen to be in the mood to tell them. The fact that economic pressure has driven women into business is taken for granted by many people who hesitate to acknowledge that the change in her economic position has rendered the wife as much in need of mental occupation as her independent sister is of a job. In addition to the fact that married women need something to replace the pride of an elder generation in its baking, weaving and brewing, there is another significant aspect to the present-day situation of the wife. She is as much as ever a part of the body-politic from a social point of view, but from an economic point of view she is an almost total loss, always a consumer but only occasionally a producer. This statement ignores the position of a wife as a mother because there are only a few years, comparatively speaking, out of a woman's life when her duties as a mother bulk large as an economic contribution to labor. Moreover, her anomalous position tends to lower the wife in the eyes of society and this is apt to interfere with the child's proper development, for children are very sensitive to the regard in which their mother is held and anything which tends to raise or lower that regard bears directly on their moral well-being.

Women Need Interests Outside the Home

Let us take up the question of the wisdom of encouraging wives of utility men to take an active interest in the industry, first of all, as regards the situation of the women themselves. It may be taken for granted that any husband or father is aware, without consideration of the fact, that women no longer play the economic part in the life of the home which they played a few generations ago when the labor of every able-bodied woman in the house was a necessity to the continuation of the

MRS. McArthur, wife of the vice-president and general manager of the Pacific Power & Light Company, Portland, having organized the women related to that company by blood and marriage (so to speak), also is active chairman of the Women's Committee of the Northwest Electric Light & Power Association, and in connection with such activities has given much thought to utilizing the women of the industry to fuller extent. Touching on the changed economic position of the housewife in our present-day industrial and social structure, she points out in this article the advantage to all concerned of encouraging the wife of the utility-company employee to devote her intelligence and part of her energy to the benefit of her husband's business.

community. I disregard the favored few of all periods who have not felt the necessity of doing what may be called any economic work in life. Some of them are not worth considering; others have brought us enough that is rare and beautiful to need no apology. Men are quick to recognize the effects of lack of responsibility or too much leisure on another man; why do they not perceive with equal clearness the intellectual and ethical effects of lack of adequate occupation on a woman?

Even her duties as a mother are lightened automatically for the modern woman through the reduction in the size of her family forced by the increased cost of living. To declare that many women would have big families if they could afford it merely strengthens the argument in favor of their accepting new obligations. The fact remains that the necessity to work in order to keep fed and clothed and housed cannot be removed from the shoulders of the women of any nation and that necessity be replaced with empty leisure to be filled with movies, novels, bridge or boredom, without altering the moral as well as the social life of men and women both. Men and women rise or fall in the social scale together, not singly. If your women are not fit intellectually to take an intelligent interest in the business which provides them with a living then they are not fit either to be your companions or the mothers of your children. They may very easily be your inferiors in education while still possessing the mental capacity to learn.

Some men secretly object to their wives being taught anything about business for fear that this new interest will inspire the women to talk indiscreetly of private affairs. Haven't these very women discretion enough to keep their mouths shut? Most men talk to their wives about their business problems; surely they cannot believe that the only reason that their confidences are not violated is because their wives are too stupid to give them away. As to the objection that men that talk business at home never get a change of scene from the offices, let it be said that the more

a wife is encouraged to find out for herself, the less talking at cross purposes there will be for almost every woman is more anxious to divert her husband's mind from business than to pin it there. It is unfair to ask hundreds of intelligent women to remain in ignorance of the source of their living because of the tactlessness of a few "Dumb Doras."

Women of the Industry Should Be Organized

With regard to the general situation from the point of view of the electric light and power industry itself, let us admit that this industry is one of the greatest civilizing factors in modern life. As such it comes into intimate contact with the life of the majority of American women, for whether electricity is available to their use or not, the knowledge of its aid as a labor-saver subconsciously affects their mental attitudes, and the good will of these women, as users or potential users of electricity, is important to the utilities. Any good will, to amount to anything, must be based on understanding, else it is liable to turn with the first breath of opposition into prejudice. The day will come when executives all over the country will be amazed to remember a time when they discounted the influence of the wives of the industry in gaining the comprehension of women voters and citizens for the problems and services of the utilities. Indeed many executives heartily approve of including wives in the general scheme of education for utility employees, now generally in force throughout the United States and great success is being encountered in certain companies in the Northwest that have experimented in this way. In these companies the wives have demonstrated that their intellects and their ingenuity are capable of contributing to the advancement of the company or to the strengthening of its position.

The industry is faced with many problems which involve the need of procuring a favorable hearing from women. Most of the women connected with the industry either by pay check or marriage are in a position to help their companies materially in securing this interest. If there is an objection to wives and employees working together toward the same ends it is always possible to organize them separately and play one against the other. It seems to the writer, however, that any company in which wives and employees do not come into natural, pleasant contact, no matter how casual, is in need of the interest and assistance of all its women. After all, there should be no awkwardness between wives and employees in their mutual relations. Women in business already have proved their integrity and high standards and if there is friction, apparently it is the fault of the wives in the first place. If the relations between wives and employees were as pleasant in all companies as in the one with which the writer is connected there certainly never would be a fear lest unpleasantness arise in the course of organizing the wives, who, moreover, given every desire to do so never could participate in office business.

If there exists in your company a condition where the wives themselves do not care to be in-

involved in any group activity where they would be brought into more or less close contact with each other, then it is high time you picked out the most incorrigible woman of the lot and explained the situation to her. Where there is jealousy between wives it is always reflected in their husband's work in some form. Many women who behave in such a way as to prejudice their husband's careers might, if handled with a little tact and perspicacity, be turned into enthusiastic helpmeets and supporters of the industry, as well as clever defenders of office peace. Moreover, the utilities command the services of broad-gaged men with insight and public spirit, just the type to do that very thing once they give it their attention.

Woman's Influence Is Great

Women already possess sufficient tact and, where necessary, may be trained to sufficient democracy to enable them to mix on equal terms with anyone without either loss of independence or undue intimacy. Such a point of view may be novel to some women but they are the very ones whom it is most important to reach. Any husband who feels that his wife cannot be trusted to grow in the right direction either is unworthy of her or else is going to be handicapped by her anyway. Let those that think the utilities are not conducting a training school for women realize that half-loyal wives are as much a handicap to the industry as self-loyal employees; that wives' opportunities for contact with the public indeed give them an influence for or against their companies almost greater than that of employees, and that an ignorant, misinformed wife can do more harm in half an hour than a paid employee of the company can make up in a year's work. Do not let any lazy, pretty woman tell you that your wives will be spoiled, or that they have too much to do, or are incapable of understanding what you want them to do. Remember that there has not been as much incentive for wives to adjust themselves to present-day social conditions as there has been for women gainfully employed, and be patient with them.

There is nothing the matter with our married women today but the lack, or an excess, of economic pressure to make the most of themselves. Even religion is based on activity of the spirit. If you are a utility man, help your wife to feel the wholesome urge of effort, bodily and mental, and the spiritual will follow if it does not precede. There will be group instruction and plenty of work for wives in every utility company as soon as you say the word loudly enough.

Anaconda to Get Largest Hoists.—Six new electric hoists, three of which will be among the largest ever made, are to be installed by the Anaconda Copper Mining Company in connection with the extension of three of its Butte mines to a depth of 5,000 ft. Hoist equipment for two will be furnished by the General Electric Company and the Nordberg Manufacturing Company, while the third shaft will be equipped by the Allis-Chalmers Manufacturing Company.

Radio Interference from Power Circuits

By Philip S. Donnell*

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UP TO the present time electric light and power companies have been called upon twice to study the effect of their power circuits upon the electrical circuits of others. The first call came from the telephone companies, which said that their wire lines were picking up through electromagnetic and electrostatic induction the hum of alternating current and that it was interfering with the purposes for which their lines had been constructed. After

some preliminaries the companies operating sources of interference co-operated in such fashion that within a few years the general problem of interference had been solved and working agreements laid down based more or less upon the Golden Rule.

Now a second call has arisen, and it is the same cry—interference. Having rid the circuits of the telephone companies of foreign potentials commensurate with the potentials rightfully existing in them, it might have appeared that the trouble was over, but with the advent of radio an entirely new situation has arisen. Voltages, which upon the solution of telephone problems were undetectable, now become annoying due to the extreme, inherent sensitivity of radio receiving sets. In the early days of radio with the crystal and single-tube sets, these voltages, although in evidence, did comparatively little harm, but now with the multiplication of amplification and the desire to pick up weaker and weaker signals from more and more distant stations, the power companies again are confronted with the necessity of making a drastic examination of their lines and equipment to eliminate even the most minute radiations of energy. So sensitive are the radio receiving sets that whereas the telephone circuit was at first the one interfered with now it has joined the ranks as a source of interference.

When it is realized that 10 watts or one ten-thousandth of one per cent of the energy in a 10,000-kva. circuit may be radiated from a poor contact or a dirty insulator on a 66-kv. line and that amateurs are using this same amount of energy for transatlantic communication, it is evident that something has to be done. Because of the enormous growth of the radio industry to a point where practically one out of every five homes

IN discussing this subject, which is of the greatest importance to the power companies at the present time, the author has combined the essential features of recent papers on the subject with the results of his personal investigations. He gives the question a thorough treatment and brings it up to date, at the same time making a number of suggestions for elimination of sources of interference and complaints.

has a receiving set, immediate action was necessary. So many new problems followed in the steps of radio development, however, that it is little wonder that some of the most vexing still remain to be solved.

Responsibility

Without going farther into the history of the development of radio it is sufficient to say that public utilities in general, after some little coercion, have realized the absolute necessity of coping with the

problem of interference. There may be some executives who refuse to recognize complaints but they are few. Most companies have realized that there are two important reasons why it will pay to act, viz: (1) the maintenance of good will between utility and consumer which means co-operation and loyalty from the public, both indispensable in these days of regulation; and (2) the development of radio because it means added revenue to the companies in the way of energy sales already estimated at \$40,000,000 a year. A careful analysis of the load of fifty customers of an Eastern utility for several months before and after the purchase of a radio receiving set showed that there was an increase in the average monthly kw-hr. consumption from 31.35 to 43.7 kw-hr. or 39.5 per cent. From information derived from other sources it may be said that these figures are fairly representative. They represent the increase in domestic lighting consumption which might be expected if every home became addicted to the new fad. The increase is due to two sources, the greater use of lights and in the supply of energy necessary for actual operation of the set through battery charging. This latter load is increasing as newer types of sets eliminate the use of batteries.

There has been a decided change in the percentage of complaints proving to be bona fide cases of trouble since those days two or three years ago when the owner of the radio receiver knew little of the meaning of the noise in his set and less of the theory of its operation. At that time the attitude of the utility companies was one of, "We are not interested," and the public press and radio organizations blamed all troubles on the light and power industry. In those days perhaps fifteen per cent of the complaints was due to causes for which

*A paper presented before the convention of the New Mexico Utilities Association, Albuquerque, N. M., Feb. 16, 1926.

the utility company was responsible; today this percentage has increased probably to fifty.

An analysis of complaints made by one large company recently showed the following results:

10 per cent of the reported troubles disappeared before they could be investigated.

10 per cent were due to defects in the complainant's set.

15 per cent were due to grounded street-lighting circuits.

25 per cent were due to loose connections, poor insulation, grounds, etc., of power and lighting circuits.

40 per cent were due to a large variety of causes for which the power company in no way could be blamed, such as high-frequency experimenters, electro-medical apparatus, railroad bells, noisy motors, crossing signals, etc.

Interference Classified

The acknowledged sources of interference are (1) static; (2) regenerative sets; (3) defective connections in receiving sets; (4) equipment and apparatus connected with utility circuits, operating either normally or in some cases defectively, for the operation of which the company is not responsible; (5) the machinery, apparatus and circuits for which the utilities are directly responsible.

Of static nothing will be said. It is with the radio fan always and does not concern the power company. Of regenerative sets it can be said that careful tests have shown these to be annoying at distances from 50 to 100 miles and it is probable that 25 per cent of the difficulties would be eliminated with the disappearance of this type of set. Of defective connections in the set, obviously it may be said that the power company is not responsible.

The above types of interference again may be divided into two classes, man-made and natural. Static belongs to the latter class. Man-made interference may be divided into three classes: that resulting from high-frequency continuous waves, that from high-frequency but damped waves and that from straight magnetic induction. To the first of these belong sources (2) and (3), regenerative sets and defective connections and operations of either transmitting or receiving stations. To the latter belong sources (4) and (5) which have to do with the public utilities and the equipment connected therewith.

Detection

The detection of radio interference is accomplished in almost all cases by the use of radio equipment, and several companies already have designed some excellent portable sets for the purpose. The general method is to listen in at various places with a loop antenna and with sets of different types and thus locate the source of trouble by directive reception.

The immediate sources of the energy which causes interference are varied. As has been mentioned, interference may be caused by direct induc-

tion but this is local in character and of little consequence. It may be corrected by placing the aerial at right angles to the source of trouble. The sounds picked up usually are the 60-cycle hum or the hum of higher harmonics. The second arises wherever there is a slight discontinuity in a circuit and the contacts are separated by a small distance. An arc is formed and from this arc the energy is radiated in the form of high-frequency electromagnetic and electrostatic waves. These arcs are not necessarily continuous; they may be incipient arcs over the surface of an insulator which has become dirty, or through the cracks of the porcelain. They are nothing but a leakage current changing in magnitude and indicated now and then by a more or less infinitesimal spark. The sounds picked up in this way usually are rough and irregular as they are from radio-frequency oscillations on a circuit which is highly damped because of the high resistance.

Radiation

If this energy were radiated from the spark alone, the problem of interference never would have arisen because its effect would be purely local and the area affected restricted. The difficulty is that when the arc is formed the conductors leading away in both directions from the source of trouble act as antenna and the energy is radiated from them. If the arc is to ground, there is the antenna on one side of the arc and the ground on the other—the typical arc radio transmitting station. If the arc is between sides of the circuit it is a case of an aerial with a counterpoise.

Were it not for two things the entire interconnected power system would become the antenna. The oscillations in the arc are of high frequency, depending upon the constants of the radiating arc, and therefore leak off through the insulation more rapidly than the low-frequency, low-voltage current. Also the transformers form an almost open circuit to the frequencies in question because of their enormous impedance thereto. If then a source of trouble is in a dwelling, the extent of the territory affected by direct radiation from the arc will be small, but on the other hand the circuit leaving the house will radiate energy as will every house circuit connected thereto, as far as the transformer. Thus the unwelcome noise is carried over a much greater territory than that affected by the radiation of the spark itself.

But this is not all of the story, for if there is an open-wire telephone line not in the form of a twisted pair within 50 or 100 ft. of the power line, it will pick up the energy by induction and carry it to a still greater region. The limits to which it will reach are not restricted by transformers, as in the case of power circuits, but only by the energy dying out due to leakage and absorption. Interference thus may be carried four or five miles on telephone circuits although the telephone company's equipment may have nothing to do with the source of disturbance.

The electric light and power industry, however, is interested not only in possible sources of inter-

ference but also in some of the remedies insofar as they have been discovered up to the present. It can be said that there is much information that is not yet available except to those who have made investigations.

Interference Traceable to Power Sources

The sources of interference with which central stations are concerned directly can be divided into four main sections: power, industrial applications, household appliances, and miscellaneous. These in turn fall into the more detailed divisions treated in the following paragraphs.

(1) **Lines:** Only under abnormal conditions do these originate trouble. There are two conditions, however, which cause trouble, corona and arcing grounds. The corona will occur only on high-voltage lines or systems and is of little interest here. The grounds may occur where circuits pass through trees or come in contact with guys, or through swinging contacts between the wires themselves. The usual source of trouble is a ground through a tree. The resistance of the tree is sufficiently great to prevent a sufficiently high-current flow to operate the protecting equipment. Yet each time a contact is made with the tree an arc is formed and if the swing in the reverse direction were small the arc might persist. I have actually observed a continuous arc of this type taking place on a grounded-neutral distribution system with a phase-voltage of 2,300. Such arcs as these probably cause the radiation of more energy than any other type, and when they occur on the high side of the distribution transformers it is apparent that there are a good many miles of antenna for radiating the energy.

(2) **Insulators:** Trouble here arises either from cracks or a dirty surface over which there is considerable leakage with incipient sparking. An arc on a 66,000-volt insulator has been known to prevent entirely radio reception within a distance of six miles during the period of its flashing over. These are more or less rare occurrences as the factor of safety on insulators is fairly high. They are detected easily as the source of trouble radiates such a great amount of energy. A loop with a sensitive receiver set up in several positions away from the transmission line invariably will locate the source of trouble.

(3) **Lightning Arresters:** Obviously the discharges in this equipment are most noticeable during electrical storms when they are in legitimate operation and therefore are not a source of much annoyance. However, the necessary formation of the film each 24 hours in the electrolytic arrester is accompanied by an arc which may be heard anywhere on the system. As this is usually at some hour in the night and only momentary it is negligible in its effect, although often noticed because of the regularity of the charging operation.

(4) **Transformers:** Defective insulation in transformers will cause very severe interference, but as a rule the insulation breaks down completely within a short time after incipient arcing takes place. Regulators are in the same category as transformers, except for the automatic equipment connected with them such as the contact-making voltmeter, relay switches, etc., all of which are sources of energy emission. The suppression of this energy radiation is rather simple as it may be eliminated through the use of chokes and condensing drains to ground.

(5) **Generators, Motors and Synchronous Converters:** On large systems arcing at the slip rings on a generator as a rule spreads little trouble because of the fact that the generator feeds directly into step-up transformers. On smaller systems, where distribution is at generator voltage, arcing at the rings will cause trouble as the high frequency will be picked up by the power leads and fed to all parts of the city as far as the distribution transformers.

Oscillations set up by the sparking at the commutator of a converter as well as spreading out over the direct-current systems may travel back through the low impedance winding of the armature and out onto the alternating-current system feeding the converter as far as the transformers, which of course in most cases are located

near at hand. In one test the noise from a synchronous converter has been picked up from the a. c. feeder almost uniformly for nine miles from the machine, but only in the vicinity of the circuit. It was not perceptible at a distance of more than 150 ft. from the circuit with a 6-tube superheterodyne.

Direct-current motors, especially on street cars, are bad offenders for two reasons: first, because of the continuous operation of the contactor and probable sparking of the commutator; and, second, because of the direct connection with the low-resistance antenna system in the form of trolley and parallel feeders with no transformer winding to limit the distribution.

I recently was listening in 100 ft. away from the trolley, during the passing of a street car, and each opening of the circuit was plainly audible. Other sources of trouble on street cars are the arcing at the trolley and wheels and arcing grounds on the feeder. Insertion of chokes here and there in the feeder and laterals to trolley and also condenser drains to ground may do some good, but are expensive and afford only slight returns.

Interference Traceable to Industrial Sources

(1) **Arc Light Circuits:** A good illustration of the extremes to which the public went with its complaints in the early days of broadcasting was the attempts of the citizens of a certain town in Texas to enact an ordinance to prevent the installation by the public utility of a street arc-lighting system.

From what has been said of arcs it might appear that such a system would be the worst offender possible. On the contrary, when in proper operation the modern arc-lighting system, including the constant-current transformers and rectifiers, should cause no trouble whatsoever. As is well known, the operation of the modern arc does not require the opening of the circuit. When the voltage across the arc rises to a certain value due to its natural elongation from the combustion of the carbon, the shunt magnet is energized sufficiently to pull the electrodes together, after which one drops until caught by the clutch. During this process, therefore, there is no opening of the circuit. The worst condition arising in an arc-light circuit is lamp-jumping. Then, of course, considerable energy is released by radiation. There is little possibility of this if the globes and connections are taken care of carefully.

Under normal operation there should be no interference from the rectifier. If, however, the vacuum increases, due to the combining of the remnant of oxygen with the mercury, a condition prevails called "fading," which may result in the generation of high frequencies which are sent out over the lamp circuit. When the condition becomes still worse, so-called "pumping" of the rectifier sets, serious interference results.

This difficulty is detected by noting whether or not a periodic decrease in load current is accompanied by a decrease in secondary voltage. If it is determined that the tubes are fading, the best thing is to notify the manufacturers, most of whom are prepared to assist in eliminating the trouble. Temporary relief may be obtained by the use of condensers and heating the tube in a steam bath or even letting it rest.

(2) **Smoke and dust precipitators** are inherently the source of a great deal of trouble, but the interference can be kept quite local by proper shielding and use of drains. No doubt most of you are acquainted with the Cottrell system of precipitation, but for those who are not it may be explained that the precipitation depends upon the application of a high direct voltage between the walls of a long tube through which the dust is passed, and a wire fixed in the center of the tube. This electrostatic field causes the movement of the dust particles to the tube walls. The voltage is obtained either through the use of Kenetrons or with mechanical rectifiers driven by synchronous motors. As there is no physical contact between the brushes and the commutator in the latter type, the continuous arcing is an excellent source of high-frequency oscillations, but as the transformers are very close to the rectifiers the only real source of radiation is the lead to the precipitation plates. This lead therefore should be very short and should be shielded. If the plates are in a steel stack they will need no other shielding. If not they also should be shielded and the shield grounded. Under these conditions the only thing noticeable will be the periodic flash-overs between precipitator plates, i. e., the tubes and wire.

(3) **Sign Flashers:** These are the worst offenders as far as arcing is concerned. Although there always will be some local interference—a matter of a few hundreds of feet—the situation in general can be remedied by the use of chokes and condensers. Being low-voltage equipment, the condenser drains are not expensive. If no preventive equipment is installed, any leads not in conduit become radiative antennas as far as the transformer.

Interference Due to Household Appliances

(1) **Heating Pads:** Although the manufacturers are improving the types and construction to get rid of interference-producing characteristics, these pads have been among the most noticeable offenders because of the several thermostats connected with them. If a pad is lying out in the open where it heats and cools rapidly, the thermostatic control opens and closes very definitely and distinctly, although fairly often. This causes but a click in the receiver. When the pad is in a semi-warm position, such as next the body, the change in temperature is comparatively slow with the result that as the control depends upon the unequal expansion of two metals the contacts may remain just out of contact but with a gap insufficient to break the arc. The arc thus hangs on, producing a roaring sound in the receiver, not only in the house where the pad is, but in all receivers near the distribution lines that side of the transformer. In fact, the frequency is so low that considerable energy may pass through the first transformer, but usually there is not sufficient energy to saturate any other house circuit through a second transformer.

(2) **Violet-ray Machines:** In the usual violet-ray equipment there are two radiating circuits, one including the primary of the high-tension, high-frequency transformer and the condenser; the other the secondary and the body through the tube. The local disturbance is slight except when the tube is raised from the body which does not happen often because of the more or less painful spark resulting from so doing. The disturbance sent out on the supply circuit may be removed completely by placing across the supply terminals (two) one-microfarad condensers in series and grounding the midpoint. In a test a violet-ray equipment was detected on a six-tube heterodyne at a distance of one block, and when drained as above noted the noise was not detectable when receiver was placed close to the machine.

(3) Other types of equipment of course may be the source of arcs due to defective circuits, etc., but they are of minor consequence and will not be considered here.

Miscellaneous Sources of Interference

There are a few pieces of equipment under this heading which may be mentioned. The utilities in nowise can be held accountable for the troubles arising in connection with them, however.

(1) **X-ray Machines:** Complete data have not been taken on this type of equipment, but most indications are that when properly operated and connected the modern X-ray machine should not give serious trouble. This is contrary to the popular belief.

(2) **Mechanical rectifiers** in battery-charging equipment, on account of the continuous arcs formed at the vibrating contacts and to some extent the tube rectifiers, cause trouble which may be eliminated by the use of proper filters. Electrolytic rectifiers are not used enough to be noticed.

(3) **Electric Elevators:** There are two types of noises which arise from these: the clicks due to the making and breaking of the circuit by the contactors and the steady hum due to the operation of the motor, which, if it is d. c. and the commutation becomes bad, develops into a roar. With normal operation, the disturbances should not cover more territory than the building in which it is located. With poor contacting and poor commutation the disturbance may spread to great distances. Complete investigations of this have not yet been made, however.

(4) **Electric furnaces** are a source of much local disturbance; especially during the first or melting period, but fortunately such a furnace is always operated through step-down transformers located as close to it as possible. The result is that the energy does not get out to produce interference. During a test a receiver placed 30 ft. below the high line one mile from the furnace during the melting-down period picked up nothing.

If it is admitted that steps must be taken to eliminate interference first, from the standpoint of self-preservation as obtained through the good will of the public, and, second, because of increasing revenue gained from the encouragement of the use of radio—how far are the power companies justified in going? Some of the larger utilities already have established separate departments with highly paid men to take care of the continuous stream of complaints and to eliminate not only the causes of those but also incipient sources of trouble not yet reported.

It would appear that, for the small and medium-sized company, such a step is too drastic under present conditions because of the expense involved. Definite arrangements should be made, however, with the trouble department for handling such cases as are reported. In doing this there are two things which will be found of value—establishing cordial relations and a feeling of co-operation with the local radio club or branch of the Radio Relay League, and the establishing of a system of questionnaires which may be sent to a consumer upon receipt of a complaint. These questionnaires can be so worded that they will eliminate many trips, thus saving considerable expense and at the same time assuring the consumer that the company is anxious to co-operate with him. Of course this method will lose its effectiveness if it is not followed up with personal attention as soon as the consumer again complains. In any case there should be no discussion or attempt to evade responsibility when there is any reason to believe that the trouble may be caused by the utility company's equipment.

For the good of the utilities themselves it is wisest to meet the question of radio interference fairly and squarely and to allow for it in the budget. In the long run they will be well repaid.

California Leads All States in Hydro Generating Capacity

By F. E. Bonner

District Engineer, United States Forest Service,
California District

ELECTRIC systems of California had an installed generating capacity of 2,020,775 kva. on Jan. 1, 1926, according to a survey of the systems made by the district office of the United States Forest Service acting for the Federal Power Commission. The rating of hydroelectric generators as of that date was 1,367,250 kva.; of fuel-electric generators 653,525 kva. In terms of electrical horsepower the generator rating was: hydroelectric, 1,827,880 hp.; fuel-electric, 875,602 hp. Capacities of individual systems are shown in the accompanying table.

The records of the office show that during 1925 new hydroelectric plants with an aggregate generating capacity of 326,000 electrical horsepower were completed and placed in operation. This represents an increase of more than 20 per cent over the generating capacity existing on Jan. 1, 1925.

In the report compiled this year a new feature has been introduced in determining the generator rating. In previous years it was the custom to give merely the rated capacity in kva., but this year the record shows the output capability of the various systems in kilowatts. This output capability is based on actual performance records of various plants and indicates the switchboard output possible on sustained peaks of two or three hours under normal operating conditions. No allowance is made for possible deficiencies of the water supply of the various plants.

On this basis the output capability of the electric systems of California is 1,870,187 kw. or 2,500,920 electrical horsepower. Hydroelectric plants were able to deliver 1,277,300 kw. and steam plants 592,887 kw.

According to records of the Federal Power Commission, California, as the result of extensive installations made during 1925, now leads all states in the Union in generator rating of hydroelectric plants. According to previous compilations, the hydroelectric generator rating of New York electric systems as of March, 1925, was 1,713,551 electrical horsepower (U. S. G. S. Report, Aug. 21, 1925). The estimated additions during 1925 in that state were 37,000 hp., giving New York a present installation of approximately 1,750,000 hp. against 1,801,011 hp. for California.

The rapid progress of hydroelectric development in California is reflected strikingly in the large proportion of Federal Power Commission business that involves California projects. Up to Jan. 1, 1926, there had been filed with the commission 196 ap-

lications covering projects in that state. This represented about one-third of the applications from the whole country. The California projects authorized by license for construction up to Jan. 1, 1926, contemplate the installation of over 1,600,000 hp. This is almost half the total capacity authorized by the commission for the entire United States.

Condensation Pond as Bird Sanctuary

A unique outgrowth of the new steam generating plant of the Public Service Company of Colorado at Valmont, Colo., may be the creation of a game-bird sanctuary on the fresh water lake which provides water for condensation purposes. The proposal has come from Coloradoans who are interested in the propagation and preservation of game life and has been received kindly by the officials of the company.

The lake, which has a present area of 120 acres and which will be enlarged eventually to 540 acres, is the only body of water of such size in the state that does not freeze over in the winter. It has been suggested that because its surface is always open, various wild fowl could be trained to make it their year-around residence and it would serve as an important preserve. If the company gives its approval, it is likely that experiments will be undertaken to ascertain whether the birds will remain there if given the opportunity.

Tests on the water show that it averages 45 deg. F. near the top and it does not get below 41 deg. at the bottom. Discharge water reaches the lake at about 50 deg. in normal winters.

Generating Capacity of California Electric Systems

Jan. 1, 1926
(Compiled by U. S. Forest Service, San Francisco, representing the Federal Power Commission)

System	Generator Rating				Output Capability			
	Hydroelectric		Fuel-Electric		Hydroelectric		Fuel-Electric	
	Kva.	Hp.	Kva.	Hp.	Kw.	Hp.	Kw.	Hp.
	1	2	3	4	5	6	7	8
Pacific Gas and Electric Co.....	398,975	534,779	142,000	190,349	345,000	462,434	136,500	182,976
Southern California Edison Co.....	351,350	470,715	214,400	287,280	347,600	466,780	196,600	263,400
Great Western Power Co.....	131,600	176,344	33,000	44,220	133,000	178,220	30,000	40,200
City of Los Angeles.....	102,067	124,888			86,460	115,855		
San Joaquin Light & Pr. Corp.....	84,250	114,088	54,050	72,427	81,650	109,411	53,500	71,690
City of San Francisco.....	83,000	111,220			83,300	111,622		
Southern Sierras Power Co.....	69,308	99,530	13,250	17,580	61,425	82,295	9,900	13,000
The California Oregon Pr. Co. (a).....	71,460	95,556	200	268	69,155	92,669	200	268
Western States Gas & Elec. Co.....	33,125	44,388	10,000	13,401	26,500	35,510	8,000	10,720
Los Angeles Gas & Elec. Corp.....			125,000	167,500			105,000	134,700
Turlock-Modesto Irrigation Dists.....	19,000	25,460			22,000	29,480		
San Diego Cons. Gas & Elec. Corp.....			37,250	49,915			29,800	39,932
City of Pasadena.....			19,500	26,130			18,000	24,120
Snow Mountain Water & Pr. Co.....	9,000	12,000			6,800	9,112		
Utica Mining Co.....	2,275	3,048			2,350	3,153		
Ontario Power Co.....	1,650	2,211			1,560	2,091		
Truckee River Power Co. (b).....	8,600	11,523			8,750	11,727		
Coast Counties Gas & Elec. Co.....	990	1,326	1,250	1,675	950	1,273	1,000	1,340
City of Alameda.....			2,250	3,015			2,812	3,768
Coast Valleys Gas & Elec. Co.....			1,375	1,842			1,575	2,102
Escondido Mutual Water Co.....	600	804			800	1,072		
Total.....	1,367,250	1,827,880	653,525	875,602	1,277,300	1,712,704	592,887	788,216

(a) Includes 12,950 kva. in Oregon hydro plants and 200 kva. in Oregon steam plants.
(b) Includes 7,100 kva. in Nevada hydro plants.

CENTRAL STATION CONSTRUCTION OPERATION AND MAINTENANCE

Sheath Wear Prevented by Roller Cable Supports Inexpensive Equipment Installed at Duct-Ends Prolongs Cable Life and Prevents Numerous Failures

By F. L. Rohrbach, Underground Superintendent, The Washington Water Power Company, Spokane.

During the last ten years many improvements have been made in underground construction. Operating voltages of cables have risen to 60 kv., and an installation in New York is to operate at 123 kv. Greater care is being taken in the design and construction of manholes. The number of ducts installed in a single run is being reduced to care better for heat radiation, and many other improvements have been effected or are in process of development. Notwithstanding all of this, however, little has been done to improve conditions at the duct-ends in manholes and at station entrances. At these points occurs very serious wear on lead sheaths, the result of cable movement caused by expansion and contraction due to temperature variations resulting from varying load conditions.

A cable failure at the duct-end is more liable to involve other conductors because that obviously is the point where the protection between cables is at a minimum. There cables are brought close together to enter the duct line and fireproofing usually stops at least 1 or 2 in. from the duct-end. That this condition is serious is shown by the report of the underground systems committee of the N.E.L.A. for 1923 and 1924. On systems of 6 kv. and over there occurred in 1923 484 failures, exclusive of those failures which occurred at cable joints. Of this number it was noted that 36 were due to wear on the edge of the duct at duct-ends. In 1924 716 such failures occurred, of which 70 were due to cable wear at duct-ends. As stated, these figures do not include information regarding the operation of cables at voltages under 6 kv., a class in which one naturally assumes the cases of

failures at duct-ends would be more numerous.

To study a specific case, consider a length of cable between two manholes, the cable carrying varying loads. In this case the center point of the cable will remain at rest normally. However, as the duct-end is approached the cable movement increases in magnitude. It is greatest at the duct-end. As the cable is supported continuously at practically all points throughout the length of the run the wear due to motion is negligible. As the cable leaves the duct-end, however, it changes its direction to follow around the sides of the manhole. This fanning out of the cables at duct entrances makes it practically impossible to place cable supports close to the duct-end. Cables could be installed running straight through manholes from one duct entrance to the other, but this would interfere with the location of the manhole cover. Further if the cable thus were held rigid, by fireproofing, the cable travel at neighboring duct-ends necessarily would be increased. As an example of this refer to Fig. 1. In Fig 1-A is shown a 1,200-ft. length of cable laid in three 400-ft. runs; the total cable movement is 6 in. and this is divided equally between each manhole as indicated. The installation scheme last suggested in the above text is shown in Fig. 1-B. In this case the cable is run straight through the manholes, increasing the travel at the ends of the cable 300 per cent.

Therefore, as cables usually are installed, it is obvious that at the point where the greatest movement of cable takes place there is from 2 to 3 ft. of unsupported cable. Half of the weight of this unsupported length is carried on the duct-end and the other

half is carried on the adjoining bracket. The weight of single-conductor 1,000,000-circ.-mil. cable is 6 lb. per ft. and the weight of 3-conductor, 350,000-circ.-mil, 15-kv. cable is 12 lb. per ft. When it is considered that this weight of cable plus the weight of the fire barriers is pressing on the thin lead sheath it is not surprising that even a slight movement causes serious wear.

It has been customary to install cushions of wood, rubber, lead or zinc under the cables at the duct-ends to prevent sheath wear. Of course these cushions are a great help, but in many cases they fail of their purpose. They are objectionable for several reasons. In all cases they decrease the ventilation space. Unless they are fastened rigidly to the cable they can and often do work out, leaving the sheath to take the wear. If they are fastened to the cable they are useless when the cable creeps, a condition which can happen even on very slight grades.

These objections to the use of cushions are more or less recognized by engineers, and of late years there has been a tendency to construct duct-ends in such a way that they present a rounded surface to the cable.

Exhaustive tests have proved that even this latter construction is not efficient in reducing cable wear. Tests of 17 different duct-end cable supports were made in order to obtain comparative data. In each case 1,000,000-circ.-mil cable with 3/32-in. lead sheath was used for test. In some cases a 3-phase, 350,000-circ.-mil cable was used also. In each case the travel was 1 3/8 in. and the motion cycle was completed in 19 sec.; 5 sec. in outward motion, 9 sec. stationary and 5 sec. in return motion. Unless otherwise indicated each sample was operated 2,600 cycles. Three feet of unsupported cable protruded from the duct-end in each test case giving a weight of about 36 lb. on the supporting protector.

Fig. 2 shows 17 varieties of duct-end cable protectors and samples cut from the sheaths of the cable lengths tested with each. Samples 1 to 6 in Fig. 2 show, respectively, a smooth curved piece of a 60-kv. porcelain insulator, a curved piece of hard maple, smooth concrete, a piece of lead sheath, a piece of glass and a piece of aluminum. With the exception of Nos. 2 and 3 each material was set in concrete and all had a shaft by which they were held rigid. Results as to wear were as follows: concrete greatest, lead next, aluminum third, glass and porcelain equal, and hard wood considerably less than any of the others.

A wooden cushion and an ordinary zinc protector are shown as samples 7 and 8, respectively, Fig. 2. The result on No. 8 was surprising; during the first 200 cycles the protector re-

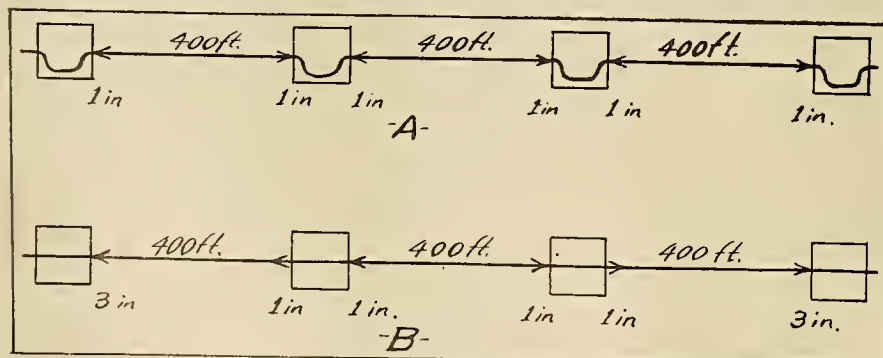


Fig. 1.—Two different methods of installing a 1,200-ft. run of cable. In case A the total 6-in. motion is divided equally between the three manholes with the resulting maximum of 1-in. travel as indicated by the arrows. In case B the motion is as indicated by the arrows and amounts to 3-in. at the cable ends.

mained at rest, but from 200 to 900 cycles the protector moved with the cable. From 900 cycles on the protector remained stationary with the result that the wear on the cable sheath was so severe that it showed a crack.

Ten tests were made using fibre duct without cushions. Varying results were noted. In several cases a 5/16

sheath sections tested is shown in Fig. 2, samples 9 to 17. These were as follows: oiled hardwood, dry hardwood, hardwood with a greater curvature, aluminum, Bakelite, and rough lead, respectively from 9 to 14 inclusive. Nos. 15, 16 and 17 are rollers with sleeves of steam hose having 7/16-in. walls. No. 14 showed considerable wear, there being a kneading effect which seemed to flake the surface of the sheath. Only a slight rolling of the lead sheath occurred with Nos. 11, 12 and 13. Practically no wear other than a polish occurred with Nos. 9, 10, 15, 16 and 17.

It is conclusively proved by these tests that some form of movable support should be used at duct-ends. Several forms of such a support were tried: sliding, carriage and roller. The disadvantages of the sliding and carriage types are that they cost more; they are hard to fasten to the cable without causing damage to the sheath; a slight change or twist in the position of the cable may cause sheath damage; and the creepage of cables on grades makes them useless there. The roller support was the most satisfactory.

The roller support developed by the author is intended for installation at the time the duct line is being built. However, it can be applied to conduit lines already constructed, provided the separation between ducts is not less than 4 in. A special type, however, is applicable to duct lines where the separation may be as little as 2½ in. This special type, shown in Fig. 3 (lower), is nearly flush with the duct mouth and does not have the set-back that the regular type has. Fig. 3-C shows one of the first models constructed; the minimum diameter of the roller was ½ in. whereas a minimum diameter of 1½ in. should be used.

The supporting casting is of galvanized cast iron, Fig. 3 (center) and Fig. 4. The roller may be made in any one of three types: a "nigger head" conforming to the shape of the duct as in examples 11, 12, 13 and 14, Fig. 2; a "nigger head" of a shape to fit the particular cable as shown in examples 9 and 10, Fig. 2; or a cylindrical roller over which may be placed a high-grade steam-hose sleeve having a wall of 7/16 in. as shown in examples 15, 16 and 17, Fig. 2. The minimum center diameter of the first two of these types of "nigger heads" should be not less than 1¼ in. while the corresponding diameter for the third type would be about 2½ in. The roller should have at least a slight curvature to provide a greater bearing surface for the cable.

Wear on the shaft of the roller is negligible. In fact, several tests of 2,600 cycles each were made using wooden shafts, and little wear showed.

Fig. 4 shows the method of installing the duct-ends. The roller is removed and the supporting casting fastened to the circular wooden form which is held firmly in place by means of a bolt through the usual pouring form at the manhole end of the duct line. The duct then is slipped over the circular form and the concrete placed. When the forms are stripped 30 or 36 hr. later the circular wooden form or plug is easily removable by striking it inward sharply two or three times and then jerking it out. This

operation gives the results shown in Fig. 3 (upper) right.

The total cost per unit for the type which requires at least 4 in. spacing between adjacent ducts is from \$1.75 to \$2, depending upon the type of roller used. The cost of the special, close-fitting type shown in Fig. 3 (lower) varies from \$1.25 to \$1.50.

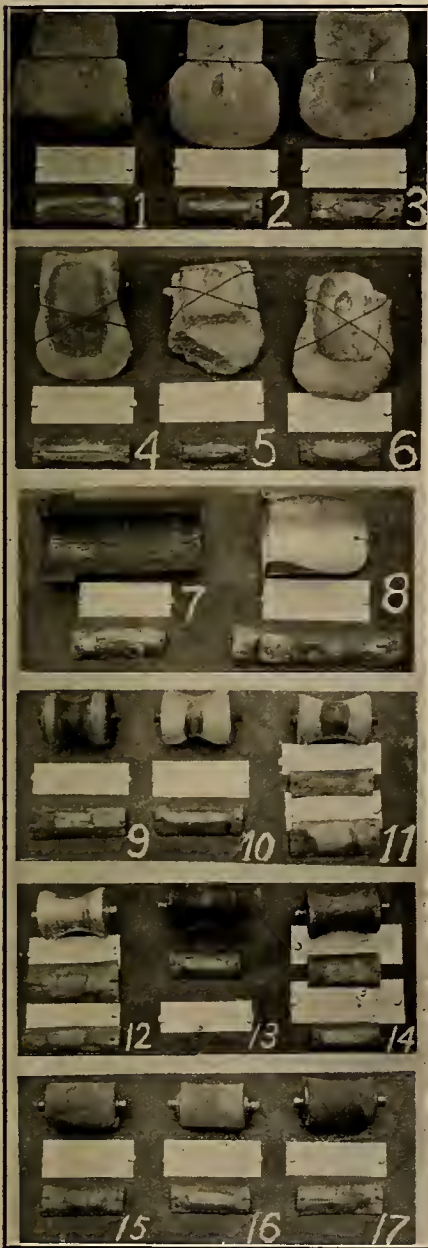


Fig. 2.—Showing 17 different kinds of duct-end cable supports and sections cut from the sheath of the cable tested in each case. See adjoining text for full details.

in. sheath wall was worn about half through, and in all cases the sheath showed considerable wear. In one case a depression about ⅔ through the sheath showed that some hard object had been in the softer fibre and had worn a slot in the sheath. A small quantity of fine sand placed beneath the sheath increased the wear greatly.

A test on a tile duct used without a cushion under the cable resulted in the lead sheath wearing completely through in 1,500 cycles.

Following the above-outlined tests a series of tests with movable duct-end cable supports was made. A comparison of the rollers and of the cable-

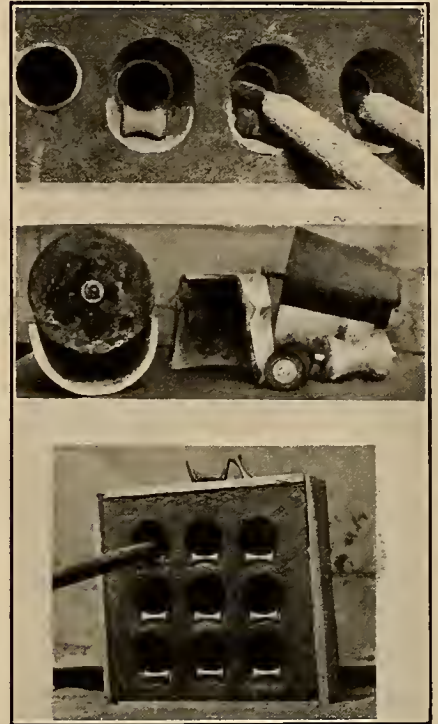


Fig. 3.—Typical examples of cast-in roller and support (above). (Center) Left—Circular wooden form and cast-iron roller support ready for mounting on manhole pouring form. Right—Another view of the equipment. (Below) Group installation.

In conclusion, it is believed that a duct-end construction with a roller support as described above will accomplish three important things:

- 1—Proper separation of the duct-ends.
- 2—A means of extending fireproofing clear into the duct entrance.
- 3—Prevention of wear on lead sheaths.



Fig. 4.—Showing (below) cast-iron support and roller, (center) support and circular wooden form in place on manhole form ready to receive the duct at the right, and (above) completed assembly ready for pouring of concrete.

Interesting Features of Dispatching System

By W. C. Foster, Assistant Operating Engineer, Portland Electric Power Company, Portland, Ore.

The load-dispatching system of the Portland Electric Power Company has been in operation since 1912. The present office is located on the sixth floor of the general office building. The office is so located as to be in direct touch with the operating engineer's office and in close touch with the offices of the vice-president, superintendent of light and power, superintendent of lines, superintendent of underground and the mapping department. The office is 15 x 20 ft. in size and is equipped with desk, telephone switchboards, system diagrams, recording and indicating voltmeter, frequency meter, indicating lamps, and miscellaneous maps and files necessary for the work.

The desk and telephone switchboards are built together into an L-shaped form and stand about in the center of the room. The telephone equipment comprises a private branch exchange and series of lines rented from the Pacific Telephone and Telegraph Company, a similar switchboard built and maintained by the power company for the control of its private lines, and a carrier-current system installed by the Western Electric Company.

The switchboard rented from the telephone company is a No. 4 board capable of handling 30 stations and 10 trunk lines. Of these, 12 stations now are in use together with two trunks to the general office PBX board, a trunk to the city manual system and a trunk to the city automatic system. The rented lines to outlying substations are two-party lines and to the more important substations and steam plants single party lines. A line direct to the police department also is provided, and intercommunication with the line department, service department, meter department and construction department is provided by a line to another PBX board at the Hawthorne Building, which is headquarters for these departments. A line to the desk of the operating engineer permits him to talk directly to any station at will through

the dispatcher's board. Several of the lines from this board are so long that long-distance equipment and local batteries are required. An extra transmitter and receiver are provided, and a key is arranged to divide the board so that two dispatchers can work in times of undue trouble. All of the boards, lines and equipment just described are the property of and are maintained by the telephone company.

The switchboard used on the company's private lines consists of a bell cabinet and a key cabinet. Ten lines now terminate at this board and give direct service to the various hydro plants, the city and interurban train dispatchers and with certain offices. All of this equipment is the property of the Portland Electric Power Company and is maintained by the company's telephone department.

Carrier-Current Phone

The Western Electric carrier-current system at present is in operation only between the Lents terminal substation and the Oak Grove hydro plant on the Clackamas River. Connection between the dispatcher's office and Lents substation is made through two cable pairs rented from the telephone company. This combination affords an emergency communication circuit between the dispatcher's office and the Oak Grove plant. Also it is possible to get messages to the other Clackamas River plants through Oak Grove when there may be trouble on communication circuits between the dispatcher's office and those plants.

Important Sub.

The dispatcher also pays particular attention to the operating condition at Alder substation in the basement of the general office building. This is necessary, for this station serves the important downtown district. In front of his desk are indicating lamps connected to potential transformers on the 11-kv. lines and the 4.5-kv. bus. An indicating and a recording voltmeter and a frequency meter also are

energized from these lines. Thus the dispatcher is advised at once of any trouble involving any of the lines to Alder substation and may take immediate steps to restore service to the substation without waiting for the operator to report all of the details. Alder substation is the main d. c. substation and has a large battery for emergency d. c. service. Relief of the battery is one reason for the necessity of prompt restoration of a. c. supply to that station.

Information Files

For assistance to the dispatchers a quick-reference file of maps is kept in the office. These are kept up to date by the mapping department. Each line is shown on a separate sheet, to scale and showing the detailed routing of the line, locations of line switches, transformers, taps and road intersections. Tower numbers are indicated at certain points to facilitate the location of trouble or linemen who may be on the line. Sketches of pole tops are given showing the actual location of the line in question. A file is kept for each class of lines. The 57 and 11-kv. lines are filed together, the 2.3-kv. lines, are circuits and railway feeders being grouped according to their class. An additional file shows the kind, size and length of conductors in the various sections of the lines and the total length for each line. A sketch of and full data on each customer's installation on the 57 and 11-kv. lines also are kept in this file. Detailed wiring diagrams of all stations are available for ready reference. All wiring diagrams are kept up to date by the engineering department.

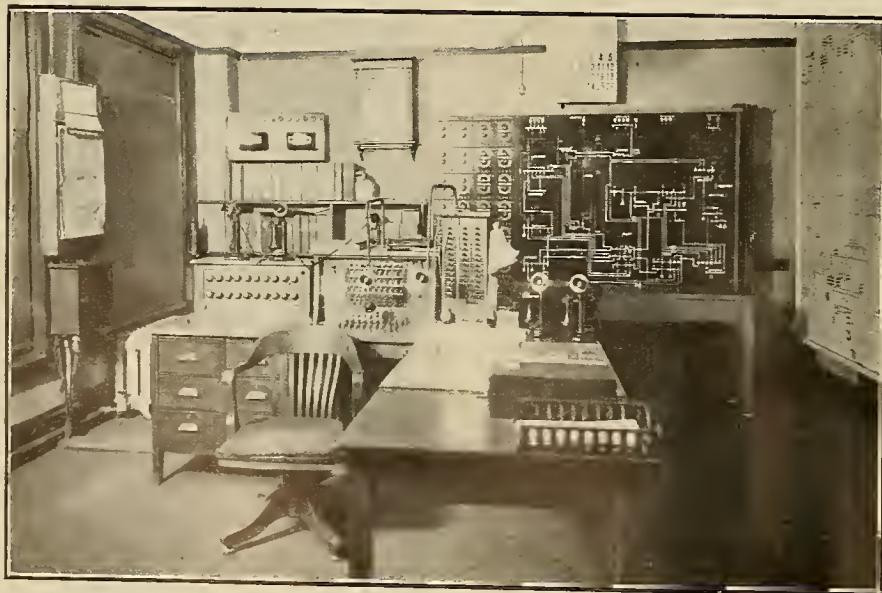
In addition to the information on file in the dispatcher's office, there are on file in the operating engineer's office, adjacent, name-plate data of equipment all over the system. This is indexed according to station.

In emergency cases the dispatcher may call out men at any time of the day or night. A card file of names, addresses, telephone numbers and occupations of different men is kept at hand, properly indexed, for the convenience of the dispatcher.

A 7½ x 18½-ft. schematic map of the system aids the dispatcher in keeping constantly posted on the operating positions of the various switches on the system. Pins are used to denote the open or closed position of the switches. An ordinary glass push-pin coated with red wax is inserted at a switch location to indicate that the switch is open. If no pin appears at a switch location on the diagram the indication is that the switch is closed. A tag system is used to denote lines out of service and the reason therefor. For future reference an exact copy of the system diagram showing all switch positions is made up by the dispatcher leaving shift at midnight. A printed 14 x 20-in. diagram of the system is used for this purpose.

Records

A continuous log is kept by the dispatching office, giving full details of all important system happenings as far as the operation is concerned. This log includes a full record of all lines or equipment out of service and details as to why it may be out, including the names of any who may be at work



Interior of Portland Electric Power Company's dispatching office. The system diagram shows on the wall at the right and the calculating board at the back.

on the lines or equipment. Switching operations also are noted in chronological order. The log is kept on letter-size bond paper, and the current and previous month are kept immediately available in a loose-leaf folder. Following this stage the sheets are transferred to a file until sheets for a year have accumulated, then they are bound into book form.

Interruptions to feeders are copied from the log and segregated according to station or line number for future reference. A separate sheet is made for each 11-kv. and each 57-kv. line. Power feeders dependent upon the lines in question are listed on the corresponding sheet. On these sheets full information is given regarding all interruptions to service. The commercial department often refers to this file to obtain information regarding the operating records of lines in which some of their customers or prospective customers may be interested. Tabulation of this information also tends to call special attention to certain lines which may be having an undue amount of trouble.

A system trouble report also is made up from the log-book information and given to the operating engineer for his use in studying the operation of the system. In addition the dispatcher on the shift closing at 8 a.m. makes out a full but brief report of interruptions, fuel burned, stream flow, system power output and other similar information. This report is on the desk of the vice-president when the office opens in the morning and is circulated later to other departments.

Operators at all generating plants keep the dispatcher posted regarding their power output and their fuel or water conditions. From this information the dispatcher keeps hourly totals of power generated, hourly records of forebay water levels and a daily record of stream flows in sec.-ft. of each plant, excepting of course the steam plants to which only the former applies. These records permit the dispatcher to regulate properly the total system load as it is divided between plants.

During low-water periods a forecast is made each day covering the load expected for the next day. An estimate then is made of the expected output of the hydro plants, based upon stream flow. These figures permit the close prediction of the amount of steam that will be necessary and due preparations may be made accordingly. Division of load between steam plants is left to the chief engineer of steam plants, who makes his decisions according to the kinds of fuel available at the various plants and according to other pertinent conditions. Further than this the dispatcher controls the division of load between plants, and the plant operator is responsible for the carrying of the amount of load assigned to his plant, the decision as to the units that operate being left to the discretion of the operator.

At the present time the dispatching force totals four men. Three of these are on duty for an 8-hr. shift each and the fourth is on from 10 a.m. until 7 p.m. as extra. This extra man keeps the office records and assists at the board when occasion demands. He also is available for shift duty when unusual circumstances interrupt the attendance of any of the other men.

Each dispatcher is off one day per week, relieved by a fifth dispatcher who serves also as a relief substation operator.

Electrostatic Synchronizer on High-Tension Lines

By F. A. THEES, Station Chief, Monolith Substation, Southern California Edison Company.

An electrostatic synchronoscope was installed at Monolith substation of the Southern California Edison Company in January, 1925. The station is supplied by two hydro plants, one containing five 2,500-kva. units, the other two 17,500-kva. units. When it became evident that synchronizing equipment would be an advantage at Monolith substation, conditions did not warrant the installation of the standard type and the necessary potential transformers. Hence the electrostatic device was chosen.

This device consists of three small glass tubes mounted in a round meter case. These small tubes are filled with Neon gas which has the property of emitting a reddish glow when a discharge occurs through it. Such a discharge would be furnished by bridging the last insulator next to ground in a multiple-disk string of insulators.

As the bus in this case originally was mounted on four suspension units, the end strings were changed to five units in order to provide a greater factor of safety to bus and synchroscope. The synchroscope is connected between the two buses. From the ends of the outdoor 60-kv. buses the wiring for the synchroscope is brought to a pipe frame on the end of the control building, there dropping down to loops secured on the tops of pin-type insulators. At that point Johnson transmission line clamps are used to provide a means of disconnecting the inside wiring from the bus leads. As only one bus can be taken out of service at one time, one set of leads always is energized. Thus it is necessary to ground leads when doing any work on or near them. The lead wires are taken into the building through porcelain tubes designed for 2,500-volt service.

The synchroscope itself is mounted on a panel some seven feet above the floor and in plain sight of the switchboard. The distinctive color of the glowers is plainly visible at all times. No hood is needed to keep out the light even though there is a window directly back of the instrument.

The top lamp is connected so as to be black at synchronism. The phase leads to the two lower lamps are crossed so that the lamps will be bright at synchronism. When out of synchronism there will be apparent rotation of the glowers, the direction of

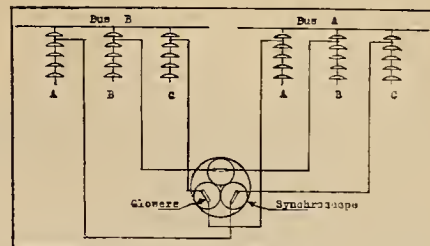


Fig. 2—Schematic wiring diagram showing method of connecting electrostatic synchronizer between the two 60-kv. buses.

which will indicate whether the incoming line is fast or slow. When first connected the top glower was connected between like phases. These particular phases were the outside legs of the bus, and it was impossible to make the top lamp black with buses in synchronism. By trying various combinations it was found that by connecting the top lamp across the two like center phases it would go black at synchronism.

Upon completing the installation the new device was checked against a standard type of synchroscope. After checking it the next step was to synchronize with the new instrument, and this was done very successfully. The electrostatic device did not check exactly with the standard by about "5 minutes," imagining a clock face as the synchroscope dial. However, the comparison was so close that the operator could be reasonably sure of synchronism. After installation and check a card showing the rotation for fast and slow was mounted alongside the instrument.

As to actual experience with the device several details have been noticed. While synchronizing with the glower instrument, making approximately one revolution every 15 seconds, voltages being equal on both sides, the top glower will be black for one second. With increasing voltage difference this period will become shorter until at about 15 per cent difference in speeds there is but a very slight indication of synchronism. This feature will prevent synchronizing with a very great difference in voltage. A peculiar characteristic is that the top lamp will light up for a minute or two after the switch is closed. Also, with the instrument on the line and the buses in synchronism, the top glower will flicker on and off at different times. The cause of this has not been determined.

The instrument is left on the line at all times. The glowers apparently last as long when used as when idle. Of the three original glowers, one went out at the end of 95 days. Operating trouble in the form of short tube-life has been experienced with these tubes.

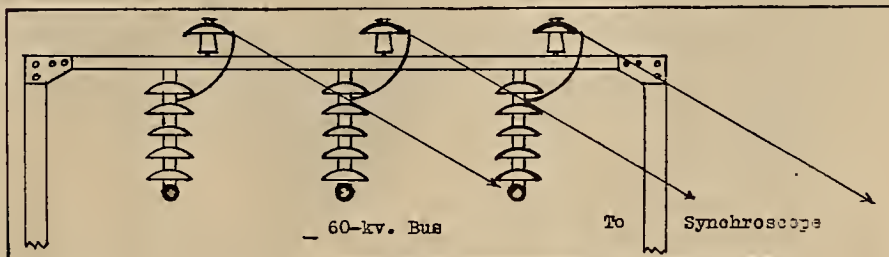


Fig. 1—Detail showing the method of attaching the leads for the electrostatic synchronizer to the bus insulator string. The pin-type insulators used in this case are designed for 15 kv.

IDEAS FOR THE CONTRACTOR

Electrical Advertising—Its Forms and Design — V

The Concluding Article of a Series on the Forms,
Characteristics and Design of Signs

By C. A. ATHERTON, National Lamp Works of the General Electric Company

Exact Calculation of the Spot Size

The apparent size of the spot of light from a bare incandescent lamp is the basic unit in the design of every exposed lamp pattern. The apparent diameter of this spot of light to the normal eye depends principally upon the following factors:

1. Its candlepower in the direction of the observer;
2. The distance to the observer;
3. The total light in the field of vision and the concentration of light near the lamp under observation, called the background brightness;
4. To a lesser extent it depends upon the color of the light and the transparency of the atmosphere.

For all ordinary purposes the fourth

condition may be ignored. It is necessary, therefore, to know only the size of the lamp, the distance to the observers, and the condition of surrounding brightness. Of these, the third only is difficult to determine. In Table No. 5 numerical values are given for the limits and a range of conditions of background brightness which are designated as AB, because of the equation from which they are determined). The most important part of the surrounding brightness is, of course, the rest of the sign. This may be determined roughly by the number of lamps in the sign, as indicated in the table.

The apparent size of the spot of light from a lamp in an exposed-lamp sign may be determined from the equation:

Spot Size—Exact Method

$$S = \frac{D}{AB + 0.0083 D} + 0.0035 D$$

"S" is the diameter measured in inches of the apparent spot of light. "D" is the distance measured in feet from the lamp to the observer. "A" and "B" are constants which depend upon the candlepower of the lamp in the direction of the observer and upon all other light in the field of vision and its angular relationship to the light under observation (Table No. 5).

From Table No. 6 the spot diameter may now be obtained (either directly or by interpolation) from the background brightness factor and the viewing distance.

Confetti Method of Predetermining Sign Appearance

One simple procedure for using the spot design method involves the use of confetti. A sketch is made up of such a size that when the confetti is pasted on the outlines of the letters or figures the result is a clear picture. The relation between the size of the sketch, the separation of any two lines on the sketch or any part of the sketch and the similar part of the sign itself is, of course, the same relation that exists between the size of the confetti and the calculated spot size of the lamps. Before giving final approval to the sketch, however, it should be viewed at a distance which bears the same relation to the maximum viewing distance of the sign as the confetti size does to the spot size.

The spot design method (using confetti) may be summed up and illustrated in the following steps:

1. Obtain and measure some round disc confetti. (For example it might measure 0.188 inches.)
2. From the circulation study find the shortest and the longest distances at which the sign must be effective and from Table No. 7 find the corresponding spot sizes. (Ex.—Shortest distance 400 feet, longest distance, 1,500 feet. Spot sizes, 4¼ and 12 inches respectively.) The minimum spot size (4½ inches) determines the lamp spacing for the sign. (In this case the lamps should be spaced on 4½-inch centers.) The maximum spot size (12 inches) is the factor upon which legibility depends. The confetti is used to represent the spots of light viewed at the maximum distance.
3. Determine the ratio of the size of the confetti to the maximum spot size. (Ex.—0.188 to 12 or 1 to 64.)
4. Draw on black paper the outline of the sign as large as you think it would have to be to be legible, assuming that the spots of light from the lamps would be the same size as the confetti. The critical part of the study, from the standpoint of legibility, is that part where the lines are closest

Table No. 5—Background Brightness and Lamp Factors (AB in Equation)

Lamp Size Watts, Clear Glass Coil Filament	Size of Sign Total Lamps	DISTRICT BRIGHTNESS FACTOR									
		1	2	3	4	5	6	7	8	9	10
10	100	400	365	330	295	260	230	200	175	150	125
10	500	500	460	420	380	340	300	265	235	205	175
10	1000	600	550	505	455	410	370	330	295	260	225
10	2000	700	650	595	545	490	445	400	355	315	275
15	100	350	320	290	260	230	205	180	155	130	110
15	500	450	415	380	345	310	280	250	220	190	160
15	1000	550	505	460	420	380	325	370	315	260	210
15	2000	650	600	550	500	450	410	370	330	290	250
25	100	325	295	265	235	210	185	160	135	110	90
25	500	430	395	360	325	290	260	230	200	170	140
25	1000	510	465	420	380	340	305	270	235	205	175
25	2000	600	555	510	465	420	380	340	300	260	225
50	100	275	245	220	195	170	150	130	110	90	70
50	500	350	320	290	260	230	205	180	155	135	115
50	1000	425	390	355	320	290	260	235	210	185	160
50	2000	500	460	420	385	350	320	290	260	230	200
75	100	225	200	180	160	140	120	105	90	75	60
75	500	285	260	235	210	190	170	150	130	110	90
75	1000	345	315	285	255	230	205	180	160	140	120
75	2000	400	370	340	310	280	250	225	200	175	150
100	100	200	180	160	140	125	110	95	80	65	50
100	500	250	230	200	180	160	140	120	105	90	75
100	1000	300	275	250	225	200	180	160	140	120	100
100	2000	350	320	290	265	240	215	190	165	145	125

Table No. 6—Apparent Spot Size—Values of Apparent Spot of Light Diameters "S" in Inches
(Obtained from the formula above.)

D—Viewing Distance in Feet	AB- 50	AB- 100	AB- 200	AB- 300	AB- 400	AB- 500	AB- 600	AB- 700
200	4.6	2.7	1.7	1.4	1.2	1.1	1.0	0.99
400	8.9	5.3	3.4	2.7	2.4	2.2	2.1	2.0
600	13.1	7.8	5.0	4.1	3.6	3.3	3.1	3.0
800	17.0	10.0	6.7	5.6	4.8	4.4	4.1	3.9
1000	20.7	13.0	8.3	6.8	6.0	5.5	5.2	4.9
2000	37.0	24.0	16.0	13.0	12.0	11.0	10.0	9.8
5000	72.0	53.0	38.0	32.0	28.0	27.0	25.0	24.0
10000	110.0	90.0	70.0	61.0	55.0	52.0	50.0	48.0
20000	163.0	145.0	125.0	113.0	106.0	100.0	96.0	93.0

together. If this part is legible, the entire display will ordinarily be legible. Therefore cover this part of the study with a thin layer of paste and lay on the confetti, overlapping the discs so as to make a solid line. (A moistened pencil eraser may be used to pick up the confetti.)

5. Look at the picture at a distance which bears the same relation to the maximum viewing distance of the sign as does the confetti to the maximum spot size. (Ex-Viewing distance for picture = $\frac{1}{64} \times 1500 = 23\frac{1}{2}$ feet.) Does the critical part appear legible when viewed at this distance? If so, the study is satisfactory or perhaps may be made even smaller. If it is illegible, it is necessary to increase the size and try again.

When the picture study is satisfactory, the ratio between the size of the study and the actual size of the sign is that of the confetti size to the maximum spot diameter. (In this case 1 to 64.; the sign therefore is made 64 times the size of the satisfactory study.)

Thirty-two Ways to Kill an Association

1. Don't come to the meetings.
2. But if you do come, come late.
3. If the weather doesn't suit you, don't think of coming.
4. If you do attend a meeting, find fault with the work of the officers and other members.
5. Never accept an office, as it is easier to criticize than to do things.
6. Nevertheless, get sore if you are not appointed on a committee; but if you are, do not attend committee meetings.
7. If asked by the chairman to give your opinion regarding some important matter, tell him you have nothing to say. After the meeting tell everyone how things ought to be done.
8. Do nothing more than is absolutely necessary; but when other members roll up their sleeves and willingly, unselfishly use their ability to help matters along, howl

- that the association is run by a clique.
9. Hold back your dues as long as possible, or don't pay at all.
 10. Don't bother about getting new members. Let the secretary do it.
 11. When a banquet is being given, tell everybody money is being wasted on blow-outs which make a big noise and accomplish nothing.
 12. When no banquets are given say the association is dead and needs a can tied to it.
 13. Don't ask for a banquet ticket until all are sold.
 14. Then swear you've been cheated out of yours.
 15. If you do get a ticket, don't pay for it.
 16. Asked to sit at the speakers' table, modestly refuse.
 17. If you are not asked, resign from the association.
 18. If you don't receive a bill for your dues, don't pay.
 19. If you receive a bill after you've paid, resign from the association.
 20. Don't tell the association how it can help you; but if it doesn't help you, resign.
 21. If you receive service without joining, don't think of joining.
 22. If the association doesn't correct abuses in your neighbor's business, howl that nothing is done.
 23. If it calls attention to abuses in your own, resign from the association.
 24. Keep your eyes open for something wrong and when you find it, resign.
 25. At every opportunity threaten to resign and then get your friends to resign.
 26. When you attend a meeting, vote to do something and then go home and do the opposite.
 27. Agree to everything said at the meeting and disagree with it outside.
 28. When asked for information, don't give it.
 29. Curse the association for the incompleteness of its information.
 30. Get all the association gives you but don't give it anything.
 31. Talk co-operation for the other fellow with you; but never co-operate with him.
 32. When everything else fails, curse the secretary.

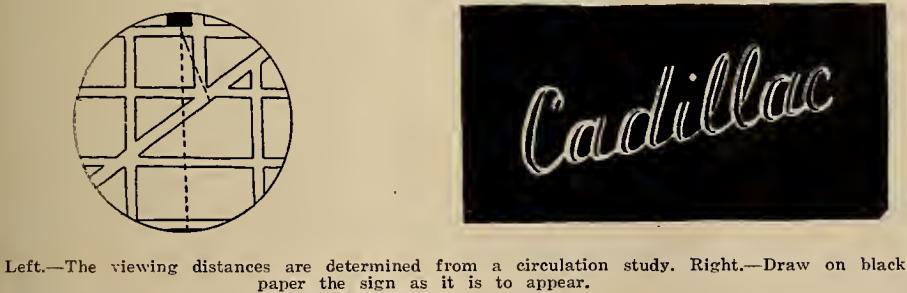
—Builders' Exchange Journal, San Francisco.

Table No. 7—Approximate Spot Size of Exposed Lamps

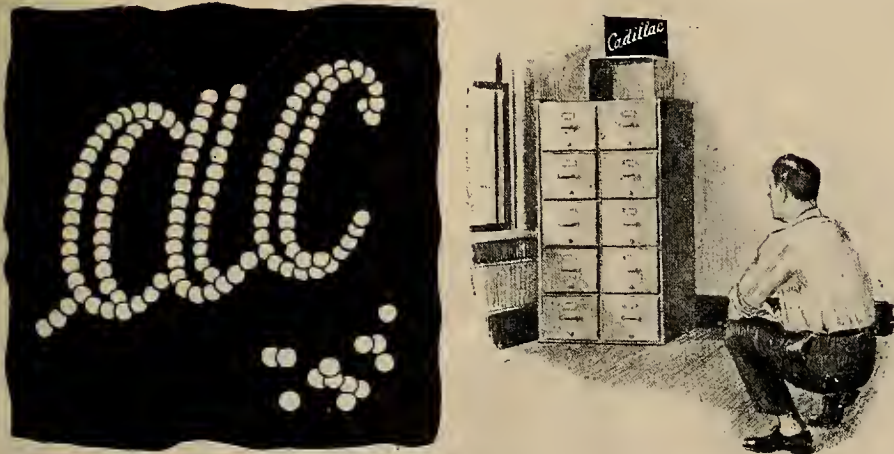
Distance in Feet from Sign to Observer.....	200	300	400	500	600	700
Size of Spot of Light in Inches—at Sign.....	2½	3½	4½	5	5¾	6½

Distance in Feet from Sign to Observer.....	800	900	1000	2000	3000	4000
Size of Spot of Light in Inches—at Sign.....	7	7½	8	16	22	27

Distance in Feet from Sign to Observer.....	5000	(1 mi.)	7500	10000 (2 mi.)
Size of Spot of Light in Inches—at Sign.....	32		44	60



Left.—The viewing distances are determined from a circulation study. Right.—Draw on black paper the sign as it is to appear.



Left.—The critical part of the sign is that in which the lines are closest together. Right.—Look at the picture at a distance which bears the same relation to the maximum viewing distance as does the confetti to the maximum spot size.

Fig. 29. The simplest method of employing the spot sign method involves the use of white confetti on black paper.

Attractive Advertising Program of Wiring Campaign

A beautiful brochure containing copies of advertisements to be run in connection with its "Check Seal" wiring campaigns has just been issued by the Pacific States Electric Company. The book contains 22 pages of color reproductions of advertisements to be run in national magazines, faced by line reproductions of the same advertisements as prepared for running in local newspapers. A schedule of newspaper and periodical advertising in the campaign also is given.

A foreword describes to contractors and retailers the program as outlined. Window display, billboard, poster, and advertising helps available to those taking part in the campaign also are shown.

California Has a Number of Red Seal Homes

Electrical Contractors Take Advantage of the Value of the Red Seal Plan in Selling Better Jobs

With the Red Seal plan in California just getting under way, over twenty-five Red Seal homes have been built. The first of these was built in Santa Cruz by C. M. Blabon. It was exhibited under the auspices of the California Electrical Bureau in co-operation with the electragists and others in the industry in Santa Cruz. George M. Rankin of the Bureau was in charge of the home, assisted by M. L. Foster of the Coast Counties Gas & Electric Company.

This home was opened for public inspection shortly after the announce-

contractor easily sold the owner the value of having a Red Seal for his home and the necessary changes were ordered.

The first home in southern California to be displayed as a Red Seal home under the auspices of the California Electrical Bureau was shown in



Model home built by the Wilmington Builders Exchange that was wired by the electragists of Wilmington under the Red Seal specifications.



The first Red Seal home west of the Mississippi River built in Santa Cruz, Calif., where it was displayed under the auspices of the California Electrical Bureau.

in California was built and wired by E. A. Taggard, electrical contractor of Modesto. The Press Telegram, a Long Beach newspaper, also is constructing a model home which will be Red Seal.

B. H. Kirkman, electrical contractor, Watsonville, is owner and occupant of the first Red Seal home in that city. He has had large Red Seals painted on the sides of his automobile and the message, "Watsonville's First Red Seal Home."

In addition to the homes already mentioned, a large number of others have been built, ranging from a log cabin to a mansion. It is interesting to note the great number of modest bungalows which are being wired under the Red Seal plan.

Electrical contractors throughout



The first Red Seal home in the Sacramento Valley was built in Marysville. It was inspected by a representative of the California Electrical Bureau.

ment of the Red Seal specifications by the California Electrical Bureau. It was the first home to be constructed under the Red Seal specifications west of the Mississippi River and caused widespread comment at that time. The home exceeded the specifications in that an electric range actually was installed, as well as an electric water heater, air heater, refrigerator, ironer, and ventilating fan. (Journal of Electricity, Aug. 1, 1925, p. 95.)

The second Red Seal home in California to be inspected by the California Electrical Bureau was built for R. R. Sherman in Exeter, and the electrical installation was made by the Exeter Electric Company. (Journal of Electricity, Sept. 15, 1925, p. 214.) This installation was practically completed at the time the Red Seal specifications were announced. Although the requirements of the specifications were exceeded in a number of ways, it was necessary to make a few minor changes in order to comply with the Red Seal specifications. The electrical

Redlands. It was a six-room house equipped electrically throughout; this home was built by the Brashears-Alcott Company of Redlands. The showing of the home so thoroughly demonstrated to the builder the value of adequately wired homes that Mr. Brashears told a representative of the Bureau that in the future all homes built by him would contain from fifteen to twenty-five additional convenience outlets and that all would be wired under the Red Seal plan.

The Builders Exchange of Wilmington built a model home for display purposes which was wired by the electragists of Wilmington under the Red Seal specifications; William Durr was the architect. This home has been advertised widely and the publicity which has resulted to the Red Seal plan in this vicinity has been very beneficial.

The first Red Seal home in the Sacramento Valley has been opened in Marysville.

The first Red Seal apartment house

California have welcomed the Red Seal plan and realize the possibilities it offers to insure an adequate wiring installation. With this standard available, it prevents the cut-price electrical contractor from leaving out outlets and installing a job which will be unsatisfactory to the ultimate owner. The legitimate contractor has something definite to sell and is taking advantage of his opportunity.

The number of homes installed prior to the official launching of the Red Seal plan in California are evidence that the plan is salable. With the added support of the representatives of the California Electrical Bureau and the various committees throughout the industry at large, the publicity and other work being done should make the job a big success resulting in profit to the entire industry. The profit accruing to the individual electrical contractor as a result of the Red Seal plan depends on the effort he exerts in selling it to the public, the architect, builder and realtor.



Left: This Red Seal home was built in Exeter for R. R. Sherman; it was the first Red Seal home in the San Joaquin Valley. Right: Red Seal home built in Redlands by the Brashears-Alcott Company, the first one in southern California.

New Wiring Rules Adopted by Electrical Committee

Rules for Non-Metallic Sheathed Cable Proposed by

W. H. Blood Approved with Slight Changes

Rules covering the installation of non-metallic sheathed cable to be included as a new section of Article 5 of the National Electrical Code were adopted at the regular meeting of the National Fire Protection Association held in New York Feb. 18-19. Thirty-five out of a possible thirty-nine voting representatives were present in addition to A. R. Small, chairman.

A. Penn Denton, chairman of the committee on Article 5, presented a set of proposed installation rules and moved their adoption. Alexander Maxwell read the minority report of W. H. Blood, Jr., who was absent owing to illness, and moved that the rules contained therein be substituted for the rules in the majority report presented by Mr. Denton. Mr. Denton presented a personal statement in support of the majority opinion, and Mr. Maxwell read the personal statement of Mr. Blood supporting the minority report. A report was made by the chairman of the electrical committee that more than thirty signed communications had been received from inspectors who recorded a favorable impression in the use of non-metallic sheathed cable.

Chairman Small also reported the receipt of two communications from H. T. Dyett, president of the Rome Wire Company, one of which was an emphatic protest against the adoption of rules for non-metallic sheathed cables as proposed by the majority of the Article 5 committee. The other communication contained a chronological history of the efforts to obtain recognition for non-metallic sheathed cable, and supported the contention that there has been unnecessary delay in making a decision as to whether or not non-metallic sheathed cable should be admitted to the Code or not.

H. N. Pye was reported to be in support of the minority report of Mr. Blood. The motion to substitute the minority report was passed after considerable discussion by a vote of 24 to 11.

Text to Be Revised

As the text of the proposed rules contained in the minority report were not in conformity with the editorial form required by the Code, the chairman of the electrical committee was empowered to revise the text to meet these requirements. Some of the proposed rules were approved and some amended. Paragraph g, with sub-paragraphs 1, 2 and 3 will be revised, eliminating the phrase "as on side-walls" and then having the entire sense of the paragraph include provisions having the sense of paragraphs m, n, o, and s of Section 501 of the code included in the paragraph g.

Rules Which Are Approved

The following rules for non-metallic sheathed cable have been approved by the committee. These rules are as submitted by Mr. Blood with the amendments and changes as voted at the meeting, but before the editorial revision which will be made by Chairman Small:

- a. Shall be of approved make.
- b. May be used on circuits where the maximum difference in potential between any two wires does not exceed 300 volts; in sizes from No. 14 to No. 8 inclusive and in two- and three-wire assemblies.
- c. May be used in dry places only and shall not be permitted in stables, laundries, chemical works or other places where dampness is liable to accumulate. It shall not be laid in plaster, cement or similar finish.
- d. May be run without insulating supports or separators, exposed on woodwork, plaster, cement or brick where these surfaces are always dry. Shall be supported by approved fastening devices spaced not farther than 4 ft. apart.
- e. May be used in concealed work and may be fished without supports from outlet to outlet.
- g. Shall be suitably protected where subject to mechanical injury, by one of the following methods:
 - (1) By running boards not less than $\frac{1}{2}$ in. in thickness and 2 in. in width.
 - (2) By guard strips not less than $\frac{7}{8}$ in. in thickness placed on each side of and close to the cable and at least as high as the thickness of the cable.
 - (3) By metal pipe or conduit.
 - (4) When run through timbers must be as near as practicable to the center of horizontal wall studs and not less than 2 in. from the upper edge of floor joists.
- h. May be used in approved conduit when the regular installation rules for conduit are followed.
- i. Shall be provided with approved outlet boxes or plates to which it shall be securely fastened by approved fittings.
- j. Shall be so handled that the outside covering will not be injured.

The majority report of Article 5 committee will be submitted to the American Engineering Standards Committee as the minority report of the electrical committee. This will be done at the request of some of the members of the electrical committee who were not in agreement with the whole committee.

Rules for procedure in the committee were proposed at the meeting; these were referred to a special committee for a report.

Discuss a 1926 Edition of Code

The advisability of printing a 1926 edition of the Code or a supplement to the 1925 Code in order to record officially the action of the committee and make it available for general distribution was discussed. A definite decision on this will be made by the National Fire Protection Association. The dates for submission of reports of article committees were advanced in order to expedite matters.

Other important changes were made by the committee. Among these was the adoption of a table of gutter widths for vertical wires No. 1 or larger in order to deflect them from the point of entrance or exit from a cabinet. The use of auto-transformers on polyphase circuits was referred to a joint committee. Rules with respect to underfloor raceways were adopted. Two rules in Article 6 are quite a departure from present practice in that they will permit the use of wire smaller than No. 18.

Rule 16 was amended materially and will apply to all appliances rather than to heaters exclusively. The use of type C cord now has been restricted. The rules for radio equipment have not been changed, but an elaborate report probably will be presented next year.

Questions and Answers on the Code and Safety Orders

Arrangements have been made with Claude W. Mitchell, electrical engineer of the Board of Fire Underwriters of the Pacific, to answer through the columns of the Journal of Electricity such questions on the National Electrical Code as are of general interest.

Similar arrangements have been made with George E. Kimball, electrical engineer of the Industrial Accident Commission of the State of California, to answer questions on the Electrical Safety Orders issued by the Commission.

While it is the object of this department to assist in a better understanding of the Code and the Safety Orders, replies given are not to be considered as official interpretations applying in all instances, as some of the rules permit of varying interpretations under different conditions. The questioner should be guided by the inspection department having jurisdiction.

All who are interested are invited to send in their inquiries regarding the National Electrical Code to Claude W. Mitchell, Board of Fire Underwriters of the Pacific, Merchants Exchange Building, San Francisco, Calif., or to the Editor, Journal of Electricity, 883 Mission Street, San Francisco. Questions on the Safety Orders should be sent to George E. Kimball, Industrial Accident Commission, State Building, Civic Center, San Francisco, or to the Editor.

Q. 7. May the service conduit be terminated in a wiring gutter?

A. Order 707-1 (j) does not permit other conductors to be run in the same conduit with the service conductors. Where the service switch is of the safety type, the service conduit should be terminated directly in the switch case. Where a dead-front switchboard or a low-voltage open-knife switchboard is used, as sometimes permitted in certain restricted cases, the service conduit should be terminated close to the terminals of the service switch. The reason for this is obvious. Should a fire start in any portion of the wiring on the load side of the service switch and the flames be communicated to the service conductors on the line side, the insulation would be destroyed and a short circuit or ground would result. As the service conductors in the building are not protected by cutouts, a short or ground ahead of the fuses would create a dangerous condition. This also brings out the point that effective service conduit grounding is necessary to take care of excessive currents under abnormal conditions of grounds or short circuits on the service.

C. B. Harper of the Harper Electric Company, Orange, Calif., has just completed wiring a new home for Fred Alden, general manager of the California Wire Company at Orange. The new house is wired completely in every way and fully complies with the Red Seal specifications. One hundred fifty-seven outlets have been installed in the house.

C. J. Geisbush, executive secretary, California Electragists, Southern Division, and L. C. Baltzelle of the Farley Electric Company, Fullerton, Calif., presented the second lesson on electragist estimating before the San Diego Electragists recently.

H. E. Howard, electragist of Los Gatos, Calif., has moved from 33 E. Main Street to 118 Santa Cruz Avenue, that city.

BETTER MERCHANDISING

Southern Company Develops Sales on "\$ Down" Idea

Small Down-Payment Plan Attracts Many to Major Appliances and Results in Increased Sales in San Diego

The Southern Electrical Company of San Diego has found a good way to stimulate the sale of major appliances during otherwise slow seasons. At regular intervals it holds a "\$ Down" sale on these major appliances. This type of sale has proved so successful that four are held during the year. The sales are far enough apart to keep the public interest fresh, and each sale has the virtue of uncovering an entirely new field of prospects.

It has been found by the sales department that many persons are interested in either a washer, ironer, or vacuum cleaner but are afraid that they cannot spare the money because they consider them too expensive. They would not evince any interest in a purchase on the regular terms of payment. The glamor of the easy payments brings their wishes within possibility of active being.

The last "\$ Down" sale was different from the usual order. It applied only to washing machines, the various kinds handled by the firm coming under the offer. This sale proved its worth and brought excellent results. The method of procedure is interesting in view of the fact that the results were better than usual.

The sale ran three weeks. The first two weeks were devoted to plowing up the ground. An intensive newspaper campaign was carried on to acquaint people with the offer. The third week the returns came in the heaviest.

The advertising department did not get any larger advertising fund allotment for this sale than usual. It stayed on the regular percentage, and though it spent twice as much for advertising, expected twice as much in returns. Many special stunts were tried for the occasion of the "\$ Down" sale, however, all of which proved very effective.

Window demonstrations were conducted during this sale so that people who had been reading about the offer might be reminded of the washer whenever they passed the store. One of the company's stores has a large part of the window removed and made into an open-air demonstration space where the demonstrator can show the operations of an appliance outside of the store and yet not be on the sidewalk.

Another advertising stunt tried for this sale was a parade. Trucks and salesmen's cars were decorated. Each car had a washer mounted on it, and a parade that rivaled the famous circus parades passed through the streets. An effective device used in decorating the trucks consisted of a disk wheel of heavy cardboard bearing the legend "\$ Down" Sale in brilliant red, yellow

and black letters. These disks were attached to the wheels of about twenty trucks. The impression these trucks made can be measured by the fact that one man asked a member of the firm: "Say, how many trucks do you have, anyway? I see one wherever I go."

After the parade inquiries began coming in. A few came the first week, gradually increasing in number until by the third week the maximum of



Disk of cardboard announces the "\$ Down" sale, used on the wheels of all motor vehicles of the Southern Electrical Company during its sales.

prospects had been uncovered. The prospects were followed by the regular outside selling crew. All inquiries over the phone were carefully listed, and a salesman was sent out to interview the inquirer.

Not only new prospects were approached, but the sales office took advantage of the interest awakened by the sale to hunt up some old prospects. These were from among people who had been approached before but for some reason a sale to them had not been closed. In most cases the second attempt was more successful. The advantages of the "\$ Down" offer were pressed home and with interest reawakened the second effort often bore fruit. A third channel of possible sales was opened by notifying the regular customers on the books of the special offer.

So efficiently did the selling crew and follow-up system work out that by the close of the fourth week every prospect in the files had been covered. That this form of selling was attractive to prospects was demonstrated by the fact that so many new customers responded. The lure of a really easy payment plan lies in the proof that

many a woman who had had her heart set on a washer for a long time and hesitated to inquire about it for fear of the big initial payment reads of the "\$ Down" offer. How simple that sounds! Here is a chance to fulfill her dreams. But here also is the secret of the advantage in the "\$ down" sale to the dealer. The customer buys on the "\$ Down," but the dealer actually sells them on the regular monthly payment plan.

The customer fills out the "\$ Down" contract on the weekly basis plan, pays the dollar, and the balance of \$2.50 a week. At the end of four weeks she has paid the equivalent of the usual monthly payment. This is more of an advantage to the customer than at first might appear. Many persons can pay a small sum earlier, at more frequent intervals, than a big sum once a month. It is on this fact that the "\$ Down" sale is based.

After the first four weeks of weekly payments, the advantages of the monthly payment plan are suggested to the buyer. The dealer has had his sale and rounded up his customers. The payments have come in regularly. But there has been a large amount of unnecessary office routine work in taking care of the unusual weekly accounts. So with a little gentle persuasion the customer usually is converted. He (or she for the most part) sees that it would simplify matters for him to pay by the month. The office has found that less than 10 per cent stick closely to the original plan. In sixty days after the sale there isn't a "\$ Down" person left on the books!

Business has been stimulated all around, the output doubled and even the smaller dealers in the county, although not coming in on the "\$ Down" proposition, feel the profitable effects of the interest that has been aroused in washers.

Lighting School Conducted by Colorado Utility

Seventy-five salesmen from all divisions of the Public Service Company of Colorado assumed the roles of students during the week of Feb. 15 when the company conducted a lighting school at Denver unique in the annals of Western electrical merchandising. The Nela Park school, including instructors and exhibits, was moved practically intact for the occasion. The cost of the course is placed by company officials at \$25,000.

With the assembly room in the Gas & Electric Building converted into a class room, the 75 salesmen attended school from 8 a.m. to 5:30 p.m., with an after-dinner session included in the first day. Special booth facilities for the demonstration of various lighting effects had been installed at a cost of \$4,000.

Instructors included M. Luckiesh, di-

rector of the lighting research laboratories of the National Lamp Works; P. V. Zimmerman, manager of the publicity department of the National Lamp Works; A. H. Meyer, sales manager, and J. A. Munroe, special representative, of the Midland Division of the National Lamp Works; and E. W. Commerly, Walter Sturrock and L. V. James, all of the staff of the National Lamp Works.

C. N. Stannard, general manager; Charles A. Semrad, commercial manager; G. B. Buck, new business manager, and other officials of the Public Service Company of Colorado participated on the program, either as presiding officers or lecturers. Discussions following the principal talks were led by members of the sales personnel.

A feature of the instruction was the presentation of a play, "Turn to the Light" by the Doherty Dramatic Club under the direction of H. P. Tewksbury. The instruction period closed Friday afternoon, with Saturday given over to sales meetings which continued throughout the day. The week was terminated with a dinner at the Olin Hotel.

Salesmen attending came from Denver, Alamosa, Salida, Leadville, Idaho Springs, Sterling, Boulder, Fort Collins, Loveland, Berthoud, Lafayette, Windsor and Cheyenne. At the close of the course an examination consisting of twenty questions was given. Those who passed were given a certificate of merit.

The instruction covered the entire field of lighting and was designed to acquaint the salesmen with every angle of the question to the end that they might become better merchandisers as well as intelligent, capable links between the company and the buying public. During the week the possibilities for selling light in the various parts of the territory covered by the company's operations were discussed by representatives familiar with the ground.

While the school was planned with the idea of increasing sales efficiency over a period of years, its direct purpose was to prepare for a campaign on the new Mazda lamp. For this campaign a budget of 5,000 commercial lighting units and 4,000 portable lamps has been set. It is expected that each of the former will carry an average wattage of 300 and that the connected wattage will be increased by 750,000. This allows for replacements amounting to an average of 150 watts to the unit. It is expected that the portable lamp campaign will add 400,000 watts to the connected load.

It is stated that this is the first time in the history of the country that the Nela Park equipment and personnel has been moved as a unit to a distant city in order that the entire sales group of a company might have the opportunity of receiving its instruction.

Electragists Hear Merchandising Talks in South

The California Electragists, Southern Division, have just completed a series of seven meetings at centrally located points covering all of southern California to study and discuss merchandising problems. These meetings were held under the auspices of the merchandising section and were

intended to carry "a little slice of the merchandising session of the convention" to those who did not have an opportunity to attend that meeting, according to the Electragists.

The first series consisted of a talk on selling electric ranges, a demonstration of proper window decoration and display, and a talk on the Red Seal plan. Ray Turnbull, Pacific Coast sales manager of the Edison Electric Appliance Company, gave a talk on range salesmanship at the first four meetings, and P. H. Booth at the last three. C. E. Louis, of the Electric Corporation, gave the window decoration demonstration. Mr. Louis carried as equipment a model show window

which was set up at each meeting place, from which he made a very complete demonstration.

W. F. Brainerd of the California Electrical Bureau talked on the Red Seal plan at each of the meetings.

Meetings were held at the Oakmont Country Club, Glendale, covering Pasadena, Glendale and surrounding towns; Pomona, Santa Ana, Wilmington, Santa Barbara, San Diego and Los Angeles. Each of the meetings was well attended. There was a total attendance of 300, made up of electrical contractors, together with their salespeople, power company representatives, and jobbers' representatives.

THE B. C. ELECTRIC EMPLOYEES' MAGAZINE

SUPPOSING PUBLIC UTILITIES ADVERTISED AS THE MOVIES DO

**COMING! COMING!!
COMING!!!**

The Greatest Event in the History
of the Human Race!

STUPENDOUS!

MARVELLOUS!

SOUL-STIRRING!

The most wonderful sale since the dawn
of civilization

Awe-inspiring in its magnificence, for the
first time in Vancouver will be offered the
Washing Machine that will make you
gasp for breath—

The "Thor"

It took 10,000 persons two years to make

Now offered to the Vancouver people

AT REGULAR PRICES

**THE CHANCE OF A
LIFETIME**

DON'T MISS IT!

**Her Mother Never
Told Her!**

SENSATIONAL

That's the only word for it. The strangest
story of romance and adventure ever
heard since the world began. That's the
story that can now be unfolded today
in your

**Light and Power
Service**

Think! Imagine! Realize!

Five mighty, throbbing generators
whirling night and day at Stave Falls,
while your parlor light burns five hours
for a quarter of a cent.

No wonder her mother never told her!
Why should she tell her to turn out the
light? It costs next to nothing, anyway.

Supplying you with light has called
for the life-blood of thousands of brawny
men, toiling in the mountains of British
Columbia.

The Epic of the Age

No more fascinating or romantic
story of adventure has ever been told.

Simply call at our office, sign applica-
tion, and light will be yours at the touch
of a switch.

REMEMBER!

IT'S A SUPER-SERVICE

[11]

True confessions of the electric business, or advertising as she is spoke, as it were. This is a stirring example of what not to do in electric advertising, or any other advertising for that matter. "In the movies they do it" has come to mean that just because it's done in the movies is no sign that it is real, and this clever take-off on movie advertising, as it appeared in the B. C. Electric Railway employees' magazine, is an amusing commentary on the prevalent movie and sensational story magazine advertising technique.

Yuba City Dealer Evolves Unique Fixture Display Ideas

Suppose one walked into a fair and was stopped by the sight of a corner of a living room in which there appeared, every few seconds, an entirely new set of lighting fixtures, would not that sort of thing cause curiosity as to how it was done, then who did it, and many other points? This very circumstance happened all during a recent fair up Yuba City way where George W. Johnson's Electrical House is one of the shining landmarks in electrical merchandising in that section of California.

Originality is a feature of Mr. Johnson's establishment anyway. There was perhaps nothing so original in the fact that he heats his store electrically, except that few doctors are known to take their own medicine, and the fact that he has a new store, if not original, is at least indicative of growth and advancement. But these things of themselves are not as important as the particular way in which Mr. Johnson goes about doing them which, after all, is the essence of originality.

Not long ago Mr. Johnson moved into his new store in Yuba City. Immediately the natives thereabout noticed that there was one bright spot in Yuba City and that in the vicinity of the "electric house" where the slogan was announced as "if electrical, let George do it." The reason for this brilliance lay in the fact that his two windows were laid out to demonstrate just what good window lighting could be so that he could use them as sales demonstrations, even while he displayed his own merchandise in them.

In one window he installed twelve Benjamin window lighting units. In the other he installed twelve X-Ray units. These are grouped on several circuits so that the effect of different spacing of units and the corresponding differences of intensity of illumination may be seen. Needless to say, this has proved a very effective means of selling proper and adequate window lighting.

Inside the store, itself tastefully decorated and arranged, the lighting is provided from eight ceiling units of different types. Here again he uses the opportunity to display usefully each of the types of fixtures which he is ready to sell to a customer. Each of these outlets is equipped with 300-watt mogul sockets so that ample lamp wattage may be used.

Having made a specialty of lighting, Mr. Johnson has carried the same careful planning into his home-fixture display room. Each of the major fixtures is separated from its fellows by a cretonne drape which tones with the various fixture finishes. Grouped with the ceiling fixture are the bracket fixtures which match in design and color. The wall paper, too, has been selected for its harmony with the fixtures. There are display rooms for living and dining room fixtures, bedroom fixtures and kitchen and porch brackets. Floor lamps also are displayed, a floor plug being available beside each display table in the store.

So that each fixture may be individually controlled, the wiring is arranged on a rheostat switch so that each may be lighted in rotation.

To feature fixtures, Mr. Johnson arranged a novel and attention-getting display at a local fair. In a space made to appear like a corner of a room, an ingenious track arrangement brought from one side a series of fixtures, lighted them, and swung them through an aperture in the other wall, to be followed by the next fixture. In unison with the central fixture change, the wall brackets also changed automatically.

Easter Hats Made from Electric Merchandise and Hardware

A window display which was given space as a news event in the columns of San Francisco newspapers prior to the last Easter season was featured by Chas. Brown & Sons, of whose electrical department B. E. Griffen is manager. The window was in the form of an exhibit of Easter millinery entirely made up of hardware and electrical goods from the stock of the store. The hats were designed and executed by the various departments, a prize being offered for the most clever. This went to the "Radio Headset," which was concocted by the radio department out of dials, tubes, rheostats and wiring materials.

Clever labels added to the interest of the window. The electric hat, which

was made up of successive rings of colored electric lights connected to a flasher, was called the "Electric Rain-bow—a hat with both flash and color." The "Garden Hat" was made up of rubber hose, trimmed with a trowel and other gardening tools and was designed, according to the sign, "to match Milady's hose." A model made from a cake tin "Took the cake"; the "Meadowbrook Sports Hat" was composed of all sorts of tackle for brook fishing. The designs numbered fifty in all, and each had its special claim to interest.

At one side of the window was a wax figure dressed entirely in adapted hardware and crowned with electrical headgear made of electric cord and a Christmas tree set. Her dress was of chamois skins, trimmed with a front panel of window screen, edged with shelf paper. Keyholes, thumbtacks and fishing spoons added details of ornament, finished off by a combination of dog collars for a belt, a neck trimming of steel wool and a brooch made of a brass bolt. A cluster of trout flies was pinned to the shoulder. Fishing tackle provided an ornamental necklace and earrings, while curtain rings made excellent bracelets. A "throw" of chamois skins carried in one hand and a coin purse made of a pocket flask and two safety chains in the other completed the picture. Even the buckles on the shoes were made appropriately from door hinges.

The window aroused much interest on the part of the public. There were always crowds, many people endeavoring to read the signs over one another's shoulders, and practically its success was reflected in an increase in sales. More than the actual money return involved, however, which is difficult to estimate exactly, it is felt that the indirect profit from such a display is very great. The public learns to associate this particular section of the shopping district with Chas. Brown and Sons, and also learns that it is a profitable practice to turn its footsteps that way because there is always something worth-while to be seen. The very fact that the millinery displayed was made up of hardware served not only to add to the element of humor, but to focus the attention upon the articles displayed and to convey an impression of the wide variety of stock carried by the store. The idea contains a suggestion which might well be adapted to electrical merchandise.

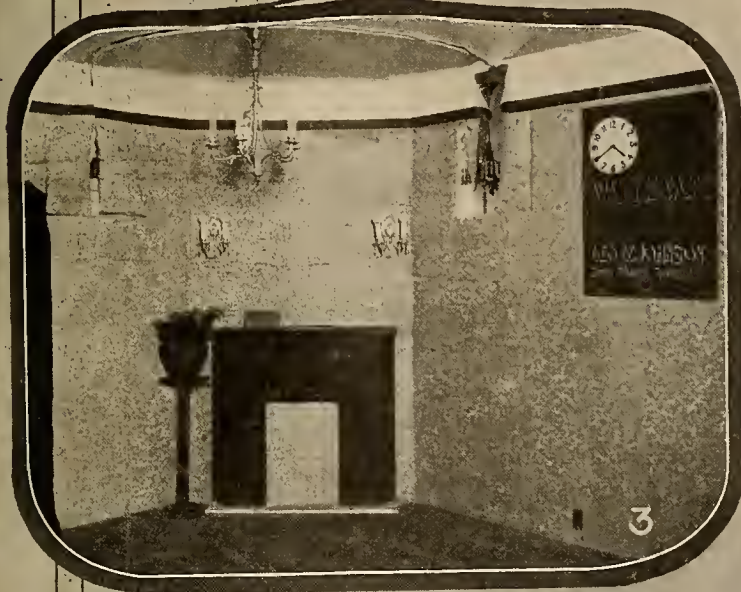
The Capitol Hill Electric Company of Denver was awarded the prize offered by the Mine & Smelter Supply Company of Denver for the best Christmas display window featuring Westinghouse appliances. This is the second year that Paul Edwards, proprietor of the company, has been awarded the dealers' display prize of fifty dollars.

Rag Rug Lighting

"I saw a dealer sell a beautiful fixture to a lady who came in for 'something cheap and inexpensive,'" said B. J. Wildman, Moe Bridges Pacific Coast manager, "by tactfully suggesting that she evidently intended to put a rag carpet on the floor to harmonize with that five-light fixture for \$8. He sold her one for \$34.50."



Miss Pottson Panns dressed in a variegated costume which, the label states, affords a "hard-ware"-ing dress for kitchen service. All the details, including the electrical hat, were made up of articles from the stock of Chas Brown and Sons, San Francisco. This was one of the features of an Easter window display which aroused much interest and was given space as a news item in the local papers.



ELECTRAGIST George W. Johnson, of Yuba City, Calif., who calls his store the "electric house," is an active and original sort of merchandiser, taking advantage of all opportunities to electrify his community. (1) The attractive new store recently opened by Mr. Johnson gives him ample window space to display his merchandise, and incidentally, by example, sells better window lighting. (2) The booth conducted at a recent Sciots' circus helped to sell electrical goods and the establishment of George Johnson to those attending. (3) An ingenious display method Mr. Johnson used in a fair booth. The lighting fixtures came in from one side, were lighted and left through an apperture on the other side to allow another type to be brought in. Bracket lights, too, were changed automatically by a clever arrangement. (4) Interior of Mr. Johnson's store, showing the fixture display room. (5) Close-up of fixture display, showing cretonne drapery separations between fixtures. Bracket fixtures are interchangeable.



NEWS OF THE INDUSTRY

Edison Company Seeks to Enjoin City From Building Steam Plant

In an application for an injunction filed in the Superior Court Feb. 27 by the Southern California Edison Company against the Board of Water and Power Commissioners of the City of Los Angeles and E. F. Scattergood, chief electrical engineer of the Bureau of Power and Light, the Edison company seeks as a taxpayer to restrain the board and its chief electrical engineer from what it charges is a threatened misuse of public funds.

The complaint is directed specifically against the proposal of the Water and Power Board to construct at Los Angeles Harbor a steam standby plant involving an expenditure of between two and one half and three million dollars. It is stated that bids for steam-plant machinery have been invited, and will be received and opened on March 2 at 3 p.m. and contracts will be entered into by successful bidders unless the court interferes.

The Edison company in its complaint also declares that construction and use of such steam plant is wholly unnecessary because of the contract which the city has with the Edison company under which the city is required to take from the company until 1932, and the company is required to furnish to the city, all of the electricity which the city needs beyond the output of its aqueduct waterpower plant. It is stated that this power contract was one of the considerations in the transaction between the city and the Edison company which was consummated in May, 1922, whereby the Edison company relinquished to the city its distributing system within the city. It is further declared that the Edison company would not have entered into the transaction for the sale of its distributing system except in consideration of that contract. It is further alleged that the total installed capacity of all aqueduct plants of the city is 88,750 kw. while the present installed capacity of the Edison company, both hydro and steam, is 490,200 kw., and that the Edison company, largely for the purpose of carrying out its obligation to the city, is at present engaged in an addition to its Long Beach steam plant which will provide 50,000 kw. additional on or about July 1, 1926. The complaint also recites that the company has available for the city all electricity possibly needed for its ordinary, extraordinary, and emergency requirements.

It is stated that during the fiscal year ending June 30, 1925, the city purchased from Edison company under this contract approximately 266,145,630 kw-hr. of electric energy, as against approximately 175,000,000 kw-hr. generated at the city's own

plants, and that the total possible output of the proposed steam plant of 25,000 kw. is 219,000,000 kw-hr., and that any electric energy or power produced by the proposed steam plant will wastefully duplicate energy and power already purchased from the Edison company; and if the steam plant is to lie idle, the investment is a sheer waste of public funds.

It is stated that the suit is filed on behalf of all taxpayers of the city as well as on the company's own behalf as an individual taxpayer.

Propose Denver \$17,500,000 Municipal Hydro Plant

A proposal for the construction of a \$17,500,000 municipally owned and operated hydroelectric plant in conjunction with the municipal water system and the Two Forks dam project on the South Platte River formally has been presented to city authorities in Denver. It follows the official announcement of the Public Service Company of Colorado that a new franchise is sought following the expiration of the present one May 15, 1926.

This is the first official injection of a municipal-ownership proposition in the Denver situation and marks the culmination of the recent development of this character in Colorado, notably in Loveland and Colorado Springs. Reports indicate that financial interests and engineers active in those conversions are behind the new Denver issue.

In the event the plan is approved by the city one of two things is contemplated, either forcing the Public Service Company or some other company to contract for the purchase of all energy generated or, failing in this, to launch the city into every phase of the electrical business.

Outside of the construction required at the dam site for water purposes,

no other financial obligations are to be assumed by the city under the plan proposed. Income warrants representing obligations against earnings rather than invested capital would be accepted in payment for the hydroelectric construction.

The Public Service Company has not expressed an opinion, but it is deemed likely that disfavor would be registered over having to purchase energy from sources other than its own while ample production is available from both steam and hydro sources.

Herbert B. Dwight, electrical engineer of the Colorado Utilities Commission, has been loaned to the city for expert services in checking the valuation announced by the public service company as the basis for rates to be decided for the new franchise.

Refrigerator Company Builds Los Angeles Plant

Construction work is to start at once on the second new factory building for the Columbia Refrigerator Company of Lankershim, Calif. Unit No. 1, which is now in use, is 35 x 80 ft. in size while unit No. 2, which is about to be built, will be 35 ft. wide and 100 ft. long.

The Columbia Refrigerator Company just recently has been incorporated under the laws of California with a capital stock of \$500,000, to manufacture refrigerator machinery, refrigerators, and refrigerant for iceless refrigeration without the use of ammonia. This is a new process invented by A. B. Cook, the production manager for the company. At present the company is confining its efforts to the manufacture of five sizes of electric refrigerating machines carrying from one-half to two-ton capacity. It is planned to begin the manufacture of household units later in the year.

Howard Seely is president and business manager of the company.



First unit of the plant of the Columbia Refrigerator Company of Lankershim, Calif. Work on a second unit is to start immediately.

B. C. Electric Railway Forms Holding Company

The incorporation of a new subsidiary of the B. C. Electric Railway Company, known as the B. C. Electric Power & Gas Company, and the issuance of \$2,000,000 in shares of cumulative preferred stock in that company in a few weeks was announced by George Kidd, president of the B. C. Electric Railway Company, March 1. This will be the first move of the company toward customer-ownership.

The new company will control the Vancouver Power Company (Lake Buntzen plants), the Western Power Company (Stave Falls), the Burrard Power Company (Alouette Development), the Bridge River Power Company, the Vancouver Island Power Company (Victoria), the Vancouver Gas Company, the Victoria Gas Company, and the B. C. Gas Company.

In explaining the new company Mr. Kidd said, "Unfortunately the B. C. Electric Railway Company, being an English company, its capital is in pounds sterling and its dividends are subject to English income taxes. It has never been feasible, therefore, to have ownership of stock or shares in the B. C. Electric Railway Company in British Columbia. For the sole purpose of enabling the public whom we serve to share in the earnings of the company, the B. C. Electric Power and Gas Company has been incorporated under the laws of this province. It will control the power plants and gas plants of the company but to all intents and purposes it will be a part of the B. C. Electric system."

The directors and officers of the new company will be identical with those of the B. C. Electric Railway Company. R. M. Horne-Payne will be chairman of the board of directors; John Davidson, vice-chairman; Sir Frank Barnard and T. Blundell-Brown, directors; George Kidd, president; W. G. Murrin, first vice-president; A. T. Goward, of Victoria, second vice-president.

Supervisors Set Valuation on Hetch Hetchy Power Plant

By a vote of 13 to 2 the Board of Supervisors of San Francisco has adopted an ordinance placing a valuation on the Moccasin plant of the Hetch Hetchy municipal project and providing for the distribution of the power revenue. The ordinance sets the valuation of the plant at \$9,000,000 and provides that the revenue from the plant's power, which is being sold under contract to the Pacific Gas and Electric Company for \$2,000,000 a year (Journal of Electricity, July 1, 1925, p. 33) shall be used for repairs, reconstruction, operating expenses of the power plant, and bond interest and redemption on the \$9,000,000 set as the cost of the plant. Any balance that remains after those payments are made shall be used for the construction of a transmission line from Newark to San Francisco and of the step-down station at Newark.

Opposition to the adoption of the measure was based on the fact that M. M. O'Shaughnessy, city engineer, had placed a valuation of \$21,000,000 on Moccasin plant and that setting it at a figure so much lower would establish a bad precedent, as that would be the amount on which other

communities would base rate demands when they wished to buy power from San Francisco.

Opposition to the proposed transmission line was voiced on the ground that its construction now would be premature and, if the people voted against a municipal distribution system, would prove to be a waste of money as it would parallel a line already in existence.

Insull Medal Awarded Employee of Edison Company

J. G. Rhoday, substation operator for the Southern California Edison Company, was honored at the luncheon of the Rotary Club of Fullerton, Calif., Jan. 27, by being awarded the Insull medal for having resuscitated his fellow worker, B. R. Lanty, after the latter had been shocked and burned by an accidental contact with a 10,000-volt switch in the Katella substation on the morning of March 30, 1925.

Mr. De Lanty was thrown from the bus structure on which he had been working to the floor below, a distance of approximately 12 ft. Mr. Rhoday,



J. G. RHODAY

who was the operator on duty at the time, rushed to his assistance. He stripped the burning clothes from the man, receiving severe burns on his hands in doing so, and began at once to use the Schaefer prone-pressure method of resuscitation. With the assistance of G. L. Ellsworth, chief operator, and H. Verloop, station electrician, he continued the work and Mr. De Lanty shortly was revived. Unfortunately he died nine days later as a result of the severe burns which he had received.

In presenting the medal J. M. Buswell of the Edison company congratulated Mr. Rhoday not alone upon the fact that he had sufficient knowledge of the prone-pressure method to put it into practice but that he had the presence of mind to start the work immediately.

Mr. Rhoday is the second Edison employee to receive the medal, the other having been presented to C. J. Gaertner, operator in Santa Paula substation, for resuscitating a fellow-worker, K. E. Kincaid, Nov. 15, 1923.

Stanford Offers High-Voltage Research Fellowship

Through an anonymous gift there is available in the electrical engineering department of Stanford University for the academic year 1926-27 a fellowship

carrying a stipend of \$500, and designated by the authorities of the University the "High-Voltage Laboratory Research Fellowship."

The purpose of the fellowship is to assist some young man of intellectual promise, but of limited means, in undertaking a year of graduate study in the electrical engineering department of Stanford University. Each applicant should request several persons who are competent to judge of his character, intellectual endowment, and ability as an experimenter to write directly to Prof. Harris J. Ryan, executive, electrical engineering department, Stanford University, Calif., in support of his application.

Applications must be received by April 1. The fellowship will be awarded May 1. All correspondence relative to the fellowship should be addressed to Professor Ryan.

Merger of Three Bay Region Jobbers Announced

A merger in which three of the leading jobbing organizations of the San Francisco Bay region figure was announced March 12, by A. R. Fierce, formerly proprietor of the Wholesale Electric Company, and president and general manager of the new concern. The Wholesale Electric Company, San Francisco; Universal Electric Company, San Francisco; and Electric & Machine Company, Stockton, are the parties concerned. Headquarters are to be at 1175 Howard Street, San Francisco, beginning April 1. The Stockton branch will continue at the same location.

Principals in the merger are: A. R. Fierce, president and general manager; George Curtis, former co-partner with Rosse M. Gilson in the Universal Electric Company, vice-president and sales manager; C. E. Condit, former proprietor of Electric & Machine Company, Stockton, treasurer.

The new company is incorporated for an authorized capital of \$400,000.

"Visitors Welcome" New Policy of Large Utility Company

Replacing the familiar and everywhere present "No Admittance" signs on all its substations and generating-station properties with a new "Visitors Welcome" sign, the Pacific Gas and Electric Company announces a new step in public-relations policy.

The idea, long thought dangerous on account of the hazard to which an uninformed public might expose itself about apparatus in which high-voltage electricity was present, has been tried out in one special case, it is understood, with particular success. In each case, where there is danger present, an attendant shows the visitors about the properties, cautioning them when necessary and explaining to them something of the operation of the apparatus.

At automatic stations, where no attendant is stationed, the welcome sign gives the public the information as to whom to see to be shown about the premises, and extends an invitation to do so. This step is felt to be in keeping with the "open door" policy of public-utility companies and is expected to help create a closer friendship and understanding between the company and its customers.

Utility-Economics Course Plan of Colorado College

What is announced as the first complete course in the economics of public utilities to be offered by any institution of higher learning in the United States has just been inaugurated by the University of Colorado at Boulder.

The course will be under the direction of Prof. Elmore Petersen, head of the extension division of the institution, who made the following statement outlining its scope and purposes: "The study of public-utility problems will not be confined to college students. Public officials, members of chambers of commerce, and similar organizations and business men who are interested in the social and political aspects of the industry are expected to avail themselves of the course.

"A demand for such a course has existed for some time. Inasmuch as regulation, taxation, financing, accounting and similar studies will be presented, we have enlisted the services of utility men who have had years of experience to assist in passing on papers and preparing practical working problems and examples."

A staff of utility and electrical manufacturing men, headed by H. S. Sands of the Westinghouse Electric & Manufacturing Company, is now at work on details of the course in co-operation with the extension division faculty. Twenty-four representative men in the public-utility field of Colorado have been added to the university faculty to assist in carrying out the instruction.

Others drafted from the utility field are: E. E. Brock, R. M. Morris, J. F. Greenawalt, A. R. Grosheider, A. S. Peters, J. E. Moorhead, George Spalding, H. W. Bellard, Roderick Reid and R. B. Bonney, of the Mountain States Telephone Company; Howard S. Robertson, W. A. Doty, N. R. Love and W. A. Alexander, of the Denver Tramway Company; Guy Faller, V. L. Board, O. A. Weller, F. R. Jamison, C. A. Semrad, F. F. McCammon, J. E. Loiseau, J. J. Ryan and C. A. Harrison, of the Public Service Company of Colorado.

Present plans provide for the establishment of at least nine major courses of study which will cover all phases of utility operation and management. Courses will be available to anyone interested, whether a resident of Colorado or not. The Rocky Mountain Committee on Public Utility Information is sponsoring the arrangements for these utility courses.

Great Northern to Electrify Seattle-Wenatchee Road

Electrification of the Great Northern Railway from Wenatchee to Seattle, Wash., has been assured by the recent signing of a contract with the Puget Sound Power & Light Company to furnish all the current required by the trains.

The electrification will be accomplished in sections, the first section, between Skykomish and the Cascade Tunnel to be electrified this summer. The Puget Sound Power & Light Company also will furnish current for the construction of the proposed Cascade tunnel, seven and three-quarters miles long between Scenic and Berne, which is to be started immediately. When the

tunnel is finished, probably the latter part of 1928, the electrification will be extended through it to Wenatchee, linking the orchard center with Skykomish, a distance of 72 miles. Under the new contract the Great Northern will turn over to the power company for operation its present hydroelectric power plant in the Tumwater Canyon of the Wenatchee River. (Journal of Electricity, July 15, 1925, p. 67).

Spirit Lake Company Has Permit for Toutle River Work

Acting for the Spirit Lake Railway & Power Company, R. W. Lincoln of Portland, Ore., was issued a temporary permit at the office of the state supervisor of hydraulics recently that will enable him to proceed with the development of a \$3,000,000 power project on the Toutle River. (Journal of Electricity, Nov. 15, 1925, p. 391.)

The permit is temporary only in that it allows time for further survey on some sites not yet fully reported on. Title is given in the permit for a 60,000 acre-ft. reservoir, which will be formed by a dam 110 ft. high and 600 ft. long. The dam alone will cost \$1,000,000, it is estimated.

The permit made valid for only eight months carries with it the provision that actual development be started within thirty days of the date of issuance and that engineering reports on progress made be filed with the supervisor of hydraulics at the termination of each 60-day period.

Power Companies and Government Settle Utah Land Dispute

Settlement of differences of long standing between the government and the Utah Power & Light Company and the Beaver River Power Company, of Salt Lake City, recently was effected with the signing of a federal court decree. The dispute involved the use of government lands by the power companies for power houses, transmission lines and other equipment. The plants involved were the Granite and Stairs plants in Big Cottonwood Canyon, the Logan plant in Logan Canyon, and the

Battle Creek plant on Grove Creek near Pleasant Grove, Utah.

The local federal court ruled that the power companies had no right to the use of the lands, and appeal was made to the circuit court and finally to the supreme court. The supreme court sustained the ruling of the lower court and also held that the government was entitled to compensation for the use of the public lands; since that time agreement has been made between the power companies and the government relative to payment for that use.

Under the decree the companies have one year to obtain permission from the Federal Power Commission to occupy the lands in question. It is understood that some of the applications made by the power companies for permits in connection with some of the plants recently have been approved by the commission and that the others will be in due course.

Los Angeles Power Bureau to Erect New Power Plant

Plans of the Bureau of Power and Light of Los Angeles call for the construction of a new 7,000 hp. hydroelectric generating plant at a point 1½ miles south of the big Haiwee reservoir along the aqueduct in Owens Valley and approximately 190 miles north of Los Angeles. E. F. Scattergood, chief electrical engineer, formally has requested the Board of Water and Power Commissioners to advertise for bids on the plant.

In his recommendation to the board Mr. Scattergood stated that the Haiwee power plant will consist of two generating units, each having a capacity of 3,500 hp. The cost of the plant, including all equipment and penstocks, will amount to approximately \$675,000, it is estimated. The plant will operate under a head of 170 ft. Acting on Mr. Scattergood's recommendation the board authorized the advertising for bids on two hydroelectric generators, two water wheels and 10,000 ft. of penstock pipe. Present plans call for completion of the plant by Sept. 15.



The largest traveling electric bake oven on the Pacific Coast as installed in the Dixie Baking Company's plant, Portland. The oven is 60 ft. long by 8½ ft. wide and has six sets of heating units connecting a total of 220 kw. Its capacity is 2,000 loaves an hour. It runs three shifts for a total of about twenty hours per day, baking the entire output of the shop including bread, cake and pie. It was made and installed by the Rainier Electric Bake Oven Company, Seattle, and is served by the Northwestern Electric Company, Portland.

Co-operative Program Approved by Refrigerator Makers

At a recent meeting of a group of the leading manufacturers of electrical refrigerators, including representatives of the Copeland Products Company, Delco-Light Company, General Electric Company, Kelvinator Corporation, Nizer Corporation and Servel Corporation, definite action was taken approving a co-operative, market-development program to be carried forward during the coming year by The Society for Electrical Development.

The program calls for a series of full-page advertisements in the Saturday Evening Post starting in May, 1926, which will be co-ordinated with the advertising of the individual companies. It also calls for the production of neutral, educational literature suitable for the use of public utilities and others who are primarily interested in selling the idea of electrical refrigeration rather than a particular make of machine.

Another important feature of the plan was the appropriation of \$10,000 for carrying on experiments to determine scientific facts about the preservation of food by some well known scientist connected with one of the great universities of the country. The results of this research will be made available to household-science departments of schools, home-study clubs and the public in general through The Society for Electrical Development and the co-operating companies.

At the same meeting steps also were taken looking toward the formation of a permanent organization to be known as the Electric Refrigeration Council, whose aim it will be to foster a spirit of friendly co-operation, both nationally and locally. In particular, it is planned to organize local councils, consisting of branch offices and distributors of electrical refrigerators, to be affiliated with the national body and with the local electrical leagues and clubs. E. G. Biechler, president of the Delco-Light Company, has been elected president of the temporary organization, with an executive committee as follows: W. R. Wilson, president, Copeland Products Company; C. W. Stone, manager central station department, General Electric Company; A. H. Goss, president, Kelvinator Corporation; O. A. Glazebrooke, Jr., vice-president, Nizer Corporation; H. G. Scott, chairman of the board, Servel Corporation; and F. M. Cockrell, secretary.

Committee Not in Accord on Colorado Modifications

The committee on irrigation and reclamation of the House of Representatives is trying, rather unsuccessfully, to agree on a bill putting in legislative form a plan for the development of the lower Colorado River along the lines suggested recently by Hubert Work, Secretary of the Interior.

The un-introduced bill before the committee provides for a dam in the Colorado at Boulder or Black Canyon to create a reservoir to contain not less than 26,000,000 acre-ft. The measure provides also for the construction of the All-American canal, but Secretary Work has suggested an amendment providing that the canal is to be built only if Mexico is unwilling

to modify the present concession, limiting the amount of water to which Mexican irrigators are to be entitled.

The \$125,000,000 needed for the development is to be borrowed on the credit of the United States for repayment during a period not to exceed fifty years.

Representative Hayden, of Arizona, a member of the committee, is bitterly hostile to the measure as it provides for the ratification of the Colorado River compact when six of the seven states in the Colorado basin have approved it.

The bill requires the sale of power at the switchboard at such rates as will permit of the retirement of the bonds within the fifty-year period. Under the strict requirements of the bill operation of the power plant need not be conducted necessarily by the government, as a proviso specifies that the Secretary of the Interior may enter into contracts for units of the plant "with right to generate electrical energy."

Meanwhile resolutions urging the legislature of Arizona to make appropriations for construction of a Colorado River dam by the state were adopted by Arizona Democrats at a meeting held in Phoenix Feb. 8. The politicians, gathered to effect a permanent organization, predicted that the Colorado River question, with opposition to nationalization of the stream, will be the principal campaign issue in Arizona the coming year. Resolutions commending Senator Ashurst and Representative Hayden for their stand in opposition to the Swing-Johnson Bill were adopted.

News Briefs

Attachment for the Heating Coils of Electrical Stoves Patented by Utility Man.—William T. Elmgren, service man in the office of the Portland Electric Power Company at Vancouver, Wash., has received a patent under date of Dec. 15, 1925, for an attachment for the heating coils of electrical stoves. The device is for covering and providing a protecting hood for that type of burner, consisting of a fire-brick body having in its upper surface grooves within which are located electrical resistance coils for heating. An important object of the invention is to provide a cover for this device which may be employed simply as a cover protecting the burner against the entry of dirt, dust and the like, that may be reversed and employed as a griddle or hot plate.

Public Service Company of Colorado Acquires Central Station of Denver Suburb.—Another Denver suburban central station has been acquired by the Public Service Company of Colorado. Arrangements were completed Jan. 1 for the transfer of the Suburban Light & Power Company of Aurora, Colo., to the Denver company. There are about 1,500 meters on the lines of the Aurora company. For the time being it is understood that the company will be operated as a separate unit.

Permits Granted for Appropriation of Water from May Creek, Wash.—Sultan Electric Company of Sultan, Snohomish County, Wash., has been granted permits by the state supervisor of hydraulics for appropriation of waters of May Creek, tributary of the Wallace River and creeks about the Roesiger Lake district. Further development, begun in 1913, will cost approximately \$505,000. Of four permits granted on the project, which includes the Lake Isabel power work, two are for reservoirs taking up a total of 10,800 acre-ft. The power developed, exact amount of which is as yet undetermined, will be used for manufacturing and power, and municipalities in the district will be supplied.

New Corporation to Furnish Electrical Energy to Centralia, Wash.—Articles of incorporation have been filed with the secretary of state at Olympia, Wash., by the Centralia Power & Light Company, Centralia, capitalized for \$50,000. The incorporators are Reid F. Hubbard, W. H. Copping and C. D. Cunningham. The new corporation, a subsidiary of the Western Cross Arm & Manufacturing Company, has a contract to furnish electrical energy to the city of Centralia. A modern power plant was completed by the company several months ago on the site of the Western mill at a cost of more than \$100,000.

Spokane Utilities' Employees Install Radio Sets in Hospital Ward.—A total of \$527.43 for the purchase of a first-class radio set for the employees' hospital ward was raised in a few days among members of The Washington Water Power Company, Spokane Central Heating Company and the Spokane United Railways. All employees are members of the said association of those companies. A committee consisting of J. E. E. Royer, chairman, W. H. Ude, A. C. Haggemiller and Emil Olson purchased the set. The total fund was so much more than expected that a maintenance fund will be established and other "sunshine" features provided for those employees who are confined to the aid association's quarters.

Puget Sound Company Completing Extensive Reconstruction Work in Lewis County, Wash.—The Puget Sound Power & Light Company, which about a year ago purchased the properties of the Washington-Idaho Light & Power Company in Lewis County, Wash., is completing extensive reconstruction work in that district. Since entering that field the company has set 500 cedar poles, installed 2,000 new crossarms and strung 41 miles of wire. Two new lines to serve farming districts have been built and applications for franchises for several others now are pending before the board of county commissioners of Lewis County.

Pacific Power & Light Company Applies for 50-Year Franchise.—The Pacific Power & Light Company has applied to the County Commissioners of Walla Walla County, Walla Walla, Wash., for a new franchise for 50 years. The company plans to enlarge its operations and take in new territory not now served. The Walla Walla County Farm Bureau has gone on record as vigorously opposing the proposed franchise.

Red Seal Plan Inauguration in California Endorsed at Enthusiastic Meeting

The first of a series of meetings held for the purpose of inaugurating the Red Seal Plan in California took place at San Jose on the evening of Feb. 18.

J. S. C. Ross of the Pacific Gas and Electric Company, San Jose, chairman of District No. 10, embracing San Mateo County and the northern section of Santa Clara County, with the assistance of Chester Hershey of the Santa Clara Valley Electrical Development League; Al Werry, president of the Peninsula Electrical Development League, and Walter T. Cox, president of the Monterey Bay Electrical Development League, representing District No. 11, embracing Santa Cruz and a part of San Benito Counties, fired the opening gun at this meeting, which in point of attendance and enthusiasm has established a record that may well be emulated by all of the other California districts.

Chester Hershey was in the chair and after the despatch of routine business turned the meeting over to Mr. Ross, as chairman of the evening. He introduced C. T. Hutchinson, chairman of the advisory committee of the California Electrical Bureau, who made a general statement outlining the history of the Red Seal movement and discussing its fundamental principles and effects upon not merely the electrical industry but on the entire community through the establishment of electrical labor-saving devices for the purpose of lightening the domestic burdens of the housewife.

He was followed by Clyde Chamblin, who as a director of the Society for Electrical Development and a member of the advisory committee of the California Electrical Bureau, discussed the Red Seal movement with particular reference to its effect upon the welfare of the contractor. Mr. Chamblin pointed out that through the introduction of higher standards of adequacy in domestic wiring the increase in the gross business done by the contractor who consistently advocated the Red Seal plan would be anywhere from 25 per cent to 50 per cent, plus the solid satisfaction that would come to the contractor in conducting his business on the basis of working up to a standard rather than down to a price, and the superior service that would be enjoyed by all with whom he did business.

M. W. Scanlon, of the Westinghouse Electric & Manufacturing Company of San Francisco, as director of publicity of the California Electrical Bureau, outlined the advertising program that was under consideration by the Bureau in order that the message of the Red Seal and its many advantages would be placed before architects, builders and prospective home-owners in order that the entire plan might be rounded out properly and made a complete structure.

Following this, motions were placed before the meeting calling for the adoption of the Red Seal Plan and accepting responsibility for its execution by the Monterey Bay Electrical Development League, the Peninsula Electrical Development League and the Electrical Development League

of Santa Clara County. In each case the members voted unanimously for the plan.

Mr. Ross then submitted an outline of his organization in District No. 10, which is divided in two sections, the northern section in charge of A. Werry as vice-chairman, and the southern section in charge of C. Hershey.

Following the naming of committees and their acceptance by those present, the chairman of the day, with an expression of appreciation for the large attendance, which was well over one hundred men who had journeyed to San Jose from territory covering more than one hundred and twenty-five miles, pronounced the meeting adjourned.

Among those who attended from San Francisco were Felix Butte, northern California chairman of the State Association of Electragists, Ed Martin, Victor Hartley, Clyde Chamblin and Charles Musladin.

Manufacturer Holds Meeting of Northern California Dealers

Northern California dealers of the Savage Arms Corporation, manufacturers of Savage electric washing machines and electric ironers, gathered at the Palace Hotel, San Francisco, on Feb. 16 to attend a sales conference with factory representatives of the company.

Chester A. Smith, manager of sales

for the Savage Arms Corporation, Utica, N. Y., was the principal speaker of the meeting. He outlined the history of the development of the washing and ironing machines manufactured by the company. He also discussed the advertising policy of the company for 1926.

The new improved washer was shown and the highlights of it discussed. "Hints on Servicing" was the subject of a talk by C. W. Adams, Pacific Coast distributor for the Savage Arms Corporation. "Merchandising and Advertising" was discussed by Walter R. Heyneman of the San Francisco Examiner. The dealer financing plan of the Westinghouse Acceptance Corporation was explained by J. T. Gibson, Pacific Coast representative.

The new Savage electric ironer was displayed and the outstanding features of the machine were explained by Mr. Smith. Many questions of individual dealers were discussed at the meeting. In the evening the dealers were the guests of the Savage Arms Corporation at a dinner in one of the private dining rooms at the Palace Hotel.

Southern California Edison Company to Begin Work on New Substation in Tulare District.—Construction of a 10,000-volt distribution substation in the Tulare district of the Southern California Edison Company is to begin at once. The station, which will be 41 ft. wide and 64 ft. long, is to be constructed of pressed brick and is to have a tile roof. It is to be ready for operation March 15, 1926, and is to cost approximately \$90,000.

Northwest Electric Light & Power Association

Women's Committee Hold Second Meeting in Seattle

Reports on women's activities in the member companies and outlines of future programs featured the second meeting of the Women's Committee of the Northwest Electric Light & Power Association, held at Seattle, Feb. 19. Educational work of different kinds has been the principal activity of the various company committees, and all representatives reported that excellent co-operation was being given their efforts. Because of the interest in the work evidenced by the many questions asked and because of the time allowed for discussion, this meeting was pronounced the best yet held by this newly formed committee of the Public Relations Section.

The following committee members were present:

Mrs. Nina Johns, Idaho Power Company, Boise; Nelle Duffey, Puget Sound Power & Light Company, Seattle; Mary K. Walsh, The Washington Water Power Company, Spokane; Ellen McCurdy, Pacific Power & Light Company, Hood River, Ore.; Estella Dorgan, Mountain States Power Company, Albany, Ore.; Esther Miller, Gray's Harbor Railway & Light Company, Aberdeen, Wash.; Marguerite

Butler, Portland Electric Power Company, Portland; Mrs. A. W. Angell, Northwestern Electric Company, Portland; Edna Comstock, Oregon Public Utility Information Bureau, Portland; and Gertrude Humphrey, Pacific Power & Light Company, Portland.

The committee chairman, Mrs. L. A. McArthur, Pacific Power & Light Company, Portland, being unable to attend on account of illness, delegated Miss Humphrey to act as chairman in her stead.

Two encouraging talks were delivered before the meeting. R. M. Boykin, manager central district, Puget Sound Power & Light Company, Seattle, urged the women to assist in fostering the quality of neatness among all employees in their own companies, and also stressed the desirability of co-operation among employees in their relations to each other as well as to the public. Col. H. G. Winsor, personnel officer, Puget Sound Power & Light Company, speaking on the value of organization, warned the women against initiating a too ambitious program at first.

Entertainment features for the visitors included a luncheon arranged by Miss Duffey, and a trip to the Elektron and White River plants of the Puget Sound company.

Pacific Coast Electrical Association

Commercial Section to Conduct Metered Water Heater Survey in California

Plans for a complete survey of metered water-heating fashioned after the electric-range survey now being completed in the Northwest were instituted at a meeting of the Commercial Section of the Pacific Coast Electrical Association held in the Los Angeles Gas & Electric Corporation Building, Los Angeles, March 5. The survey is being made at the request of the Commercial National Section, and the same instruments which were used for the Northwest electric range survey will be used.

The meeting of the Commercial Section, the last before the annual convention of the P.C.E.A. in June, was held for the purpose of hearing and discussing the final committee reports. Opening with a general meeting presided over by H. M. Crawford, sales manager, Pacific Gas and Electric Company, section chairman, the session was addressed by W. A. Baurhyte, president of the Los Angeles Gas and Electric Corporation, the president of the association. Mr. Baurhyte emphasized the increasing importance of the commercial departments of the electric light and power companies and pointed out the present tendency to increase the responsibility of commercial-department executives. The balance of the morning was devoted to meetings of individual committees at which final reports were read and approved before being turned over to the papers committee for publication.

At the afternoon session committee chairmen made reports covering the work of their committees for the year. H. H. Singletary, Pacific Gas and Electric Company, San Francisco, chairman of the electric truck committee, reported that his committee has devoted its attention to sales efforts directed toward prospective electric truck users. Two series of sales letters have been prepared which are being sent to a selected list of prospects. One series tells of the advantages of the electric street truck to 350 men who are actually prospects for this class of transportation. The second series of letters is directed to 400 prospective users of electric industrial trucks. Each series contains seven letters which are to be sent out over a period of seven weeks. The electric truck committee also is endeavoring to establish an electric transportation association in Los Angeles comparable to that which has been functioning in San Francisco for the past three years. Continuing the work of last year's committee, the customer relations committee, according to Lloyd Henley, San Joaquin Light & Power Corporation, chairman, will publish in pamphlet form the manual for employees prepared last year. These manuals will be distributed by member companies to their

employees. An essay contest then will be conducted by each company with the idea of sending the winner to the annual convention in June. In this manner interest in the manual will be developed.

Frank Boyd, General Electric Company, San Francisco, chairman of the power committee, reported that his committee had prepared a sales manual for industrial heating specialists in which data on all large industrial heating applications on the Pacific Coast had been included. This material has been compiled because many of the utilities now are employing industrial heating specialists. The sales manual will receive only limited distribution.

Lighting Talks Given in 17 Cities

One of the outstanding accomplishments of the Commercial Section this year has been the work of the lighting committee headed by Clark Baker, National Lamp Works of the General Electric Company, Oakland. Under his direction a lecture on artificial light has been prepared and delivered before thirty-five business clubs in 17 cities with a total attendance of 3,086. The lecture not only has met with exceptional success but twenty-seven requests have been received for its presentation before other organizations. It was suggested, in view of the fact that the funds of the committee had been exhausted that the portable demonstration sets which have been prepared be turned over to member companies and that members of their staffs be trained to give the lecture. Mr. Baker announced that plans have been made to broadcast the talk over KGO, Oakland, for three consecutive Monday nights beginning March 8. Mr. Baker's committee also has prepared an extensive report on street and highway lighting.

The cooking and heating committee, under the direction of P. P. Pine, San Diego Consolidated Gas & Electric Company, has prepared a number of reports. The air heating subcommittee, M. O. Lohse, San Joaquin Light & Power Corporation, chairman, has prepared some supplemental data for the air heating manual published last year. This committee also is preparing a report on "The New Electric Home" which will incorporate information on air heating.

The electric cooking subcommittee, Morris Foster, Coast Counties Gas & Electric Company, chairman, is preparing a sales manual on electric ranges to be used by range salesmen. It also has collected statistical data to bring the annual reports on the number of ranges installed, range merchandising policies, etc., up to date. A manual covering electric water heater and water-heater installation has been prepared by a special

subcommittee and will be published in pamphlet form. Commercial cooking also is being studied by a special subcommittee which will report at the June convention.

Water-Heating Survey Planned

A special subcommittee with H. K. Griffin, Western States Gas & Electric Company, as chairman has been appointed to outline plans for the survey of metered water heating which the section will conduct. The instruments which are being used in the Northwest on the range survey will be available March 15 for the committee, and it is proposed to begin the survey before the end of the current association year. The efforts of the Technical Section will be enlisted in conducting this survey, which will attempt to show such information as the load factor, diversity factor, and general effect of the water-heating load on central-station lines.

J. W. Wrenn, Great Western Power Company, chairman of the merchandising committee, reported that his committee had prepared studies covering various phases of appliance merchandising. Papers have been prepared on washing-machine merchandising, on electric ironers, on various phases of refrigeration and on merchandising policies. A report also has been prepared recommending a periodic merchandising campaign covering various small appliances.

During the meeting there was considerable discussion on periodical special price campaigns, and it was the consensus of opinion that such campaigns benefit the sale of all appliances. There was also some discussion regarding terms and time payments for larger appliances. A report on this subject will be presented at the convention by P. H. Booth, Edison Electric Appliance Company.

A. I. E. E. News

Los Angeles Section is to be addressed by Max Lee, of the Westinghouse Electric & Manufacturing Company, and C. J. Cipperly, of the General Electric Company, on the subject of "Industrial Heating." "The Principles of Domestic Electric Refrigeration" also will be dealt with by G. H. Hopkins, service engineer of the Servel Corporation.

San Francisco Section.—Michael I. Pupin, president of the Institute, will address the next meeting, Friday, March 26. Dr. Pupin last addressed a Coast gathering when he spoke to the Seattle convention last September via long distance telephone from his office in New York City; now his personal appearance is keenly anticipated. As usual, dinner will precede the meeting. Dinner will be served at Marquard's Cafe, Geary and Mason Streets, at 5:45 p.m.; \$1.10 per plate. The meeting itself is to be called to order at 7 p.m. at Yosemite Hall, N.S.G.W. Building, 414 Mason Street.



News of the Electragists



Estimators Section of California Electragists Organized

An organization known as the Estimators Section, California Electragists, Southern Division, has been formed by electrical estimators in Los Angeles and vicinity. The objects of the organization are: to make comparative time studies; to study methods of correctly estimating quantities; to co-operate with architects and engineers, distribute estimating data, co-operate with city inspection authorities and study life and fire hazards of the industry.

The inception of the organization was brought about through the interest shown by estimators and contractors in the estimating data prepared by the Association of Electragists, International, which has been explained to the members of the Southern Division of the California Electragists by their executive secretary, C. J. Geisbush and Lee C. Baltzelle, of the J. J. Farley Electric Company, Fullerton.

At the invitation of Mr. Geisbush, a number of estimators met at luncheon to discuss the need and advisability of forming an organization of estimators to have as its primary object the mutual education of its members along the lines of better estimating methods and the elimination of such undesirable features of the profession as were known to exist. Representatives from almost all of the larger shops of Los Angeles attended this meeting.

Following the meeting a tentative organization was formed that has since become permanent. Regular attendance is the price of membership, non-attendance for three consecutive meetings without a legitimate excuse to constitute cause for loss of membership.

The officers of the new organization are: president, R. L. Booth, English Electric Company; vice-president, V. B. Sayre, Golden State Electric Company; treasurer, W. L. Hyde, Newton Electric Company, Glendale; secretary, J. R. Wilson, Los Angeles Electric Works. Executive board members are: R. A. Lee, Newbery Electric Company; Bert Maybee, H. H. Walker Company; P. R. Machtolf, Machtolf-Doll Company, Glendale; and Lee C. Baltzelle, J. J. Farley Electric Company, Fullerton.

Meetings are held each Thursday from 12 m. to 1:30 p.m. at the headquarters of the Electrical Contractors and Dealers Association of Los Angeles. Anyone interested in forming a similar organization in his locality can obtain a copy of the constitution and by-laws of the Los Angeles section by writing the secretary, J. R. Wilson, 1009½ South Hill Street, Los Angeles.

The Arrow Electric Shop at 9093 Santa Monica Boulevard, Sherman, Calif., has been opened by F. E. Reynolds. Electric fixtures will be featured in addition to general electric appliances and contracting.

New Electric Club Organized in Glendale.—An electric club has been formed in Glendale, Calif., with a membership of 100. The officers are: president—D. C. Pence, Illinois Electric Company, Los Angeles; vice-president—Loren Hyde, Newton Electric Company, Glendale; secretary-treasurer—H. M. Gill, Machtolf-Doll Electric Company, Glendale; and sergeant-at-arms—C. C. Carroll. The club meets on the second Tuesday of each month. Arrangements now are being made for a regular meeting place.

The Wright Electric Company, Wenatchee, Wash., received the contract for furnishing pumps, motors, power wiring and switchboards for the proposed improvements to the municipal water system, which provides for a filtration plant of 12,000,000 gal. The contract covers the installation of the first unit, a 4,000,000-gal. installation. Shibley & Bovard, Seattle, are the engineers.



Frank J. Kiefer of the California Electrical Bureau placing a Red Seal on the Santa Cruz home. This home was the first one erected west of the Mississippi River under the Red Seal specifications.

W. C. Ashcraft, electrical contractor in Pueblo, Colo., has incorporated his business as the Ashcraft Electric Company, Inc., with headquarters at 514 West Northern Street.

J. W. Lane, J. W. Lane Electric Company, Long Beach, Calif., has been delegated to act as Long Beach representative on the executive board of the California Electragists, Southern Division.

The Ronan Electric Company, Seattle, has opened a new retail store at 1206 East 45th Street in the University district. The firm, which is composed of E. J. and C. I. Ronan, also does contracting work.

Inspectors to Meet in San Diego March 22, 23 and 24

The next meeting of the California Association of Electrical Inspectors will be held in San Diego March 22-24. Headquarters will be at the San Diego Hotel; reservations should be made at once direct with the hotel. During the convention a number of papers will be presented by prominent men of the industry.

W. J. Canada, electrical field secretary of the National Fire Protection Association, will present a paper, "Promoters of Public Welfare—The Code—The Inspector." The city attorney of San Diego will make an address on the police powers of a municipality to regulate the installation and maintenance of electrical equipment from the standpoint of public safety. H. H. Walker, president of the California Electragists, will speak on the attitude of the electrical contractor toward the electrical inspector and the necessity for a uniform ordinance in order to standardize all electrical installations in the State of California. E. J. Crawford, San Joaquin Light & Power Corporation, Fresno, will talk on the relationship of the power company and the electrical inspector. George W. Kimball, electrical engineer of the Industrial Accident Commission, will address the meeting on "Electrical Accidents in Industrial Plants," in which he will present statistical data and precautionary methods. F. D. Weber, secretary-treasurer of the Northwest Association of Electrical Inspectors, Portland, Ore., will outline the organization and work of that association. James M. Evans, electrical engineer of the Board of Fire Underwriters of the Pacific, Los Angeles, will discuss the more important changes in the 1925 code.

The report of the committee working on a uniform electrical ordinance for all cities in California is expected to be one of the most important subjects discussed at the convention.

W. M. Boyce of the Mayer & Boyce Company, San Diego, was in Los Angeles on business recently.

H. L. Miller, city electrician of Santa Barbara, Calif., has resigned to enter the electrical contracting business.

Morgan Electric Company, electrician of San Leandro, Calif., has moved from 1322 E. 14th Street to 1102 E. 14th Street, that city.

Wille Electric Motor Works, Modesto, Calif., has moved from 914 H Street to 917 I Street. C. A. Wille, electrician, is the proprietor.

George A. Adams, Whittier, Calif., has opened an electric shop at 710 S. Greenleaf Avenue. Mr. Adams will stock a complete line of appliances and will specialize in industrial wiring.

The Valley Electric Company, Auburn, Wash., formerly owned by P. W. Spence, has been sold to L. B. and W. B. Walker of Auburn. The firm conducts a modern retail and contracting service.

Grover C. Burke of the City Electric & Fixture Company, Seattle, has consolidated his branch store in the Home Savings Building on Westlake Avenue with the main establishment at 218 James Street. Additional space at the James Street location now is being occupied.

Meetings

San Francisco Electrical League Installs Officers

Officers for the present year were installed at a lively meeting of the San Francisco Electrical Development League held in the Palace Hotel on March 1. The program consisted of a one-act playlet and special musical numbers. Eugene G. McCann of the Pacific Gas and Electric Company was installed as president to succeed C. B. Kenney of NePage, McKenny Company; F. R. George, Pacific Gas and Electric Company, was elected as a director to serve the unexpired term of Mr. McCann. Other directors are: Burrrell S. Manuel, Fobes Supply Company; Victor Lemoge, electrageist; and R. J. Heffner, Pacific Telephone and Telegraph Company. Directors whose terms do not expire until a year hence are: A. H. Nicoll, Graybar Electric Company; and F. E. Boyd, General Electric Company. Roy N. Phelan, Journal of Electricity, will continue as secretary-treasurer.

Portland Company's Twenty-Year Club Holds Annual Banquet

At the annual banquet of the Twenty-Year Club of the Portland Electric Power Company, Portland, early in February, Franklin T. Griffith, president, announced that the company was considering a plan for pensioning employees though the details of this plan had not yet been worked out. Mr. Griffith assured the members present that the company recognized its responsibility to those men that had given the best years of their lives to its service.

The Twenty-Year Club now boasts a membership of nearly 300, sixty of whom became eligible during the past year. Among the latest of the new members present was Miss Anna Warnock, the first woman member to be admitted, who has been assistant paymaster of the company since Jan. 1, 1906. Twelve of the members are known informally as thirty-year men. New officers of the club were elected as follows: president—Fred Cooper, superintendent of city lines; first vice-president—T. W. Sullivan, hydraulic engineer, Oregon City, Ore.; second vice-president—R. R. Robley, operating engineer; secretary-treasurer—H. C. Schade, investment department; and trustee—E. G. Jarvis, manager investment department.

At one period in the course of the meeting silent tribute was paid to the memory of Franklin I. Fuller, who at the time of his death six weeks previously had seen thirty-three years continuous service with the company. Among the guests of honor was W. H. Lines, newly elected director of the company and head of the transportation department, succeeding F. I. Fuller in this position. C. P. Osborne, superintendent of light and power, retiring president of the club, presided at the meeting.

League Holds "Get-Acquainted" Meeting in Salt Lake City

The first of a series of periodical "get-acquainted" meetings of the members of the electrical industry in Salt Lake City was held at the Chamber of Commerce in Salt Lake City recently under the auspices of the Rocky Mountain Electrical Co-operative League. The meeting was attended by approximately 125 members of the industry and was a combined business and social gathering.

The program included short addresses by C. B. Hawley, retiring president of the Rocky Mountain Electrical Co-operative League, and George R. Randall, the new president. Mr. Hawley outlined some of the achievements of the league since its organization and urged those present to give their hearty support to the new officers. Mr.

—E. E. Brazier, Capital Electric Company, and lighting service bureau advisory committee—Thad J. Stevens, Stevens Sales Company.

The remainder of the evening's session was taken up with entertainment features, consisting principally of musical numbers by members of the league, after which refreshments were served, and a general "get-together" spirit prevailed. It is planned to hold similar meetings, particularly stressing the social idea, regularly each month.

Book Reviews

LIGHT PHOTOMETRY AND ILLUMINATING ENGINEERING

By WILLIAM E. BARROWS, Professor of Electrical Engineering, University of Maine. First edition. Embodying a thorough revision of "Light Photometry and Illumination" by the same author. 412 pages. 294 illustrations. 45 tables. McGraw-Hill Book Company, New York. 1925. \$4.

As indicated, this book is the third book on the subject to be written by the author. It is a complete revision of the author's previous book, "Light Photometry and Illumination," which in turn was a revision of "Electrical Illuminating Engineering." In each succeeding volume the author has included the latest practice in the art. This latest work is no exception.

Not only has the previous work been revised, but a great deal of new material has been added. The text has been brought up to date in all respects. The latest discoveries in the field of illumination have been included. Discussions of practice have been changed and enlarged to correspond with the present-day trend. Many new reference tables make their appearance in this volume.

Incandescent, Arc and Vapor Lamps; Residence Lighting; Commercial Lighting; Industrial Lighting; Recreational Lighting; Principles of Street Lighting; Street Lighting Practice; The Projection of Light; and Searchlights, Headlights and Floodlights, are some of the subjects that are entirely new in this text or deal with entirely new material. The chapter summaries, which were familiar practice at the close of the chapters in the older text, are entirely missing from this new work. This omission will be criticized by some perhaps for it served the purpose of setting forth briefly the outstanding points of each chapter. However, the book is an excellent text.—G.R.H.

Prime Movers Committee, N.E.L.A.—Three additional serial reports have been issued and published by this committee covering the latest developments. These reports are: Burning of Liquid and Gaseous Fuels, Boiler and Turbine Room Instruments, and Condensing Equipment. The first two of these are of the 1925-6 committee and the third is of the 1924-5 committee; 15, 23 and 71 pages, respectively. Price to members is 20, 25 and 60 cents, respectively.

COMING EVENTS

California Association of Electrical Inspectors—
San Diego, Calif.,
March 22-24, 1926.

Electrical Men of Colorado—
State-wide meeting under sponsorship of
Electrical League of Colorado
Denver, March 26, 1926

Technical Conclave, P.C.E.A.—
San Joaquin Power Building, Fresno, Calif.,
April 7-9, 1926.

Transportation Section, P.C.E.A.—
San Francisco, April 23-24, 1926.

Advertising Section, P.C.E.A.—
San Francisco, Calif.,
April 30, 1926.

National Electric Light Association—
Annual Convention—Atlantic City, N. J.
May 17-21, 1926.

Electrical Supply Jobbers' Association—
Annual Convention—Hot Springs, Va.
May 31-June 4, 1926

Pacific Coast Electrical Association—
Annual Convention—Biltmore Hotel, Los Angeles
June 8-11, 1926

Associated Manufacturers of Electrical Supplies—
Annual Convention—Hot Springs, Va.
June 7-12, 1926

Northwest Electric Light and Power Association—
Annual convention—Spokane, Wash.
June 16-19, 1926.

Randall pointed out some of the reasons why the league was organized and urged the electrical people to continue their interest in it. That interest he said should be extended to all employees of the various branches of the industry and not restricted to the officials of the various companies.

Reports of standing committees for the year 1925 were read, and then Mr. Randall announced the following appointments of committee chairmen for the year 1926: budget and activities committee—J. A. Kahn, Capital Electric Company; membership committee—B. C. J. Wheatlake, General Electric Company; ordinance committee—George R. Randall, Salt Lake Electric Supply Company; architects and builders committee—L. B. Gawan, Utah Power & Light Company; displays and exhibits committee—M. L. Cummings, Jr., Utah Power & Light Company; entertainment committee—W. A. Moser, Westinghouse Electric & Manufacturing Company; publicity committee

Personals

R. A. Balzari has resigned his position as manager of the industrial division of the San Francisco office of the Westinghouse Electric & Manufacturing Company to join the counselors' staff of the McGraw-Hill Publishing



R. A. BALZARI

Company, Inc., with headquarters in New York City. Mr. Balzari will take with him to his new position a wide knowledge gained from long experience in the electrical industry in the West and intimate contact with electrical men and affairs. After graduating from the University of California in 1908, he entered the employ of the Pacific Gas and Electric Company, leaving it at the end of six months to join the force of the Westinghouse company, an affiliation that has continued over the past eighteen years. In his capacity as manager of the industrial division of that company he has been concerned intimately with the application of electrical energy for power and other purposes in all of the industrial activity up and down the Pacific Coast, and thus has a firsthand knowledge of the application of electricity to mining, lumbering, the oil industry, iron-working establishments, agriculture and in the food products field. Mr. Balzari has been greatly interested in personnel work, with particular reference to the preliminary examination and selection of young engineering students for the training courses offered by the Westinghouse company. He has been a factor in the Pacific Coast Electrical Association, of which he has been a member of the executive committee, chairman of the membership committee, has served in various capacities in the Commercial Section, and has been a member of the Public Relations Section. It was while acting in that capacity that Mr. Balzari originated the Smiles Campaign, officially known as the Courteous Service Club, in which more than thirty thousand men and women of the electrical industry in the West were enrolled. Mr. Balzari also has been active in the affairs of the San Francisco Electrical Development League, of which he is a past president. He represented that organization and the California Elec-

trical Co-operative Campaign, now the California Electrical Bureau, of which he has served as a member of the advisory committee, at the 1922 convention of electrical leagues held at Association Island, N. Y., under the auspices of The Society for Electrical Development. Mr. Balzari is a member of the American Institute of Electrical Engineers and of the American Society of Mechanical Engineers, and also belongs to the San Francisco Transportation Club, the Commercial Club, and the Merced Golf and Country Club.

Kenneth A. McIntyre of The Society for Electrical Development, was the speaker at a luncheon held in his honor Feb. 19, in Denver under the auspices of the Electrical League of Colorado. Representative architects, realtors and builders were invited as guests of the league's advisory board.

B. E. Rowley, district sales manager of the Edison Electric Appliance Company in Salt Lake City, was a recent visitor in Denver on his way to attend the New Mexico Utilities Association convention in Albuquerque.

Frank Walsh, formerly of Bellingham and Wenatchee, Wash., has been named superintendent of light and power of the Everett, Wash., district of the Puget Sound Power & Light Company. He fills the place vacated by A. M. Chitty, promoted to managership of the southwestern district of the company. Mr. Walsh entered the Stone & Webster organization in Bellingham in 1912. For three years past he has been in charge of the Wenatchee office.

L. M. DuCommun, formerly general manager for the Bass-Hueter Paint Company of San Francisco, has organized the Pacific Paint & Varnish Company, of which he has been elected president. Offices will be maintained in San Francisco, and the company plans to erect a factory at Berkeley, Calif., in the near future.

D. R. McArthur has been elected president of the Home Gas & Electric Company with headquarters at Greeley, Colo., to succeed George D. Statler whose accidental death occurred several weeks ago. Fred Norcross was re-elected vice-president and general manager, and H. W. Farr was elected to the vacancy on the board of directors.

W. A. Tobias, manager of the Otero Gas Company at La Junta, Colo., has resigned his position to return to the United Gas & Electric Engineering Corporation in New York City. He has been an active figure in utility circles of Colorado since his arrival there in 1921.

F. O. Dolson, vice-president and assistant general manager, The Southern Sierras Power Company, Riverside, Calif., and Mrs. Dolson sailed from New York March 6 on a trip that will include the Mediterranean ports, Rome, Venice, Florence, Austria, Switzerland, Germany, Belgium, France and Great Britain.

O. A. Weller, division secretary, Rocky Mountain Division, N.E.L.A., has been named chairman of the program committee for the annual convention at Glenwood Springs, Colo.

L. W. Thayer, of the Chicago Fuse & Manufacturing Company, recently returned to Seattle after a short visit to the company's Eastern factory and offices.

Clyde Chamblin, of the California Electrical Construction Company, San Francisco, recently left for New York to attend, as executive committeeman from the Pacific Division of the Association of Electragists, International, a meeting of the executive committee of the association, and, as a director of The Society for Electrical Development, a meeting of that organization's board of directors.

Ray Turnbull, Pacific Coast sales manager, Edison Electric Appliance Company, paid a visit to Los Angeles not long ago in the interests of his firm.

H. W. Young, president of the Delta-Star Electric Company, Chicago, accompanied by Mrs. Young, recently departed on a several weeks trip to England, France and Italy.

S. Waldo Coleman, president, Coast Counties Gas & Electric Company, Santa Cruz, Calif., recently was elected to the board of directors of the Bank of California, San Francisco.

J. G. Corrin, Pacific Coast manager of the Pittsburgh Transformer Company, located in Seattle, recently spoke to the A.I.E.E. on "The Manufacture of Transformers."

D. L. Scott, manager of the recently created department of public relations of the Los Angeles Gas and Electric Corporation, has been connected with that organization since 1912. During that period he has served in the new business department, as statistician, and prior to his recent appointment held the post of advertising manager. As manager of public relations he has charge of both public relations and employee relations, which in the Los Angeles Gas and Electric organization are held to be inseparable. Mr. Scott was born in Pennsylvania, and after completing the common-school course he attended the Cumberland Valley State Normal School, from which he graduated in 1896. Following that he entered the Ohio Northern University. Prior to his affiliation with the Los Angeles Gas and Electric Corporation he taught for five years in the schools of Pennsylvania and dur-



D. L. SCOTT

ing eight years held a position in the specification and engineering department of the Westinghouse Electric & Manufacturing Company at East Pittsburgh. Mr. Scott is a member of the Pacific Coast Electrical Association, of the Pacific Coast Gas Association, and of the Pacific Coast Advertising Clubs Association.

Charles A. Semrad, V. L. Board and John E. Loiseau, executives of the Public Service Company of Colorado, attended a conference of Doherty officials in New York City late in February.

E. G. McCann, manager of the personnel department, Pacific Gas and Electric Company, San Francisco, has been elected president of the San Francisco Electrical Development League. In its new president the League has acquired as a leader a man noted for keen mentality, personality, ambition, industry, interest in and understanding of "the other fellow." He has built up the personnel department of which he is the head in less than five years and because of his vital interest in the work has achieved splendid results, acting as counselor, guide, judge and friend to about 8,000 employees. Mr. McCann, a native of Santa Ana, Calif., graduated from Stanford University in 1911 with the degree of B. A. and the following year received the degree of Electrical Engineer. A few days later he entered the employ of the Pacific Gas and Electric Company in the East Bay section doing mapping and estimating work. Later he was made superintendent of the service department, and then followed general engineering work. In his spare moments at night and on Sundays he studied law and passed the state bar examinations with the highest honors in his class. In June, 1919, Mr. McCann was transferred to the valuation department of the power company, his particular duties involving the valuation of the company's generating plants, substations and electric and steam underground systems. On May 1, 1921, he was appointed to the position he now holds. Mr. McCann has been an active worker in the San Francisco Electrical Development League, having served as chairman of the program committee and on the board of directors. He always has taken a keen interest in the affairs of the Pacific Coast Electrical Association, and is at the present time chair-

W. C. McWhinney, general business agent of the Southern California Edison Company and district Red Seal chairman of all territory on the Edison company lines in southern California, recently made a business trip in the interests of the Red Seal to Oxnard, Ventura and Santa Barbara. He was accompanied by C. J. Geishush, secretary, California Electragists, Southern Division, and W. F. Brainerd of the California Electrical Bureau. Enthusiastic meetings on the Red Seal plan were held in each of the above towns.

F. H. Reagan was unanimously elected president of the Locke Insulator Corporation, Baltimore, at a recent meeting of its board of directors.

Arthur C. Noad of the B. W. Frank Company, California representatives of the Circle F Manufacturing Company, has returned to San Francisco after an extended visit in the East visiting the Circle F Manufacturing Company factories.

Charles Borland has been appointed general sales manager of the Federal Electric Company, Chicago.

A. E. Tregenza recently has been appointed vice-president in charge of sales for the Chicago Fuse Manufacturing Company, Chicago.

Gordon Prentice, president of the Sunset Electric Company, Seattle, recently returned from an eight-day trip to Chicago.

A. E. Griswold of the A. G. Manufacturing Company, Seattle, who recently returned from an extensive trip to Los Angeles, will represent the Electric Club of Seattle at the electrical inspectors' convention in San Diego. He will be accompanied by Mrs. Griswold.

N. Hallgren, credit manager of the Puget Sound Power & Light Company, Seattle, recently addressed the Electric Club of that city on "Collections: How to Make Them."

Philip Apfel, of the Electric Heating & Manufacturing Company, Seattle, accompanied by Mrs. Apfel, is leaving Seattle for an extended business tour throughout California.

R. J. Jones, Pacific Coast representative of Arthur-Fowler Company of Spokane, has opened offices in Seattle.

J. H. McLennon of Seattle, formerly connected with the Electrical Record, has severed his connection and now is affiliated with The Selector Company.

Bernhard Badrian, who for the last two years has been acting as manufacturers' agent in San Francisco, has been appointed to the staff of The Society for Electrical Development. Mr. Badrian has moved to New York City where he will have his headquarters.

Robert A. Ilg, president, Ilg Electric Vent Company, Chicago, visited Los Angeles not long ago.

R. R. Poppleton, of R. R. Poppleton, Inc., Portland and Seattle, was recently in San Francisco making purchases of electric equipment.

G. A. Vedder, formerly manager of the supply department, Illinois Electric Company, Los Angeles, has been appointed assistant sales manager of that company. E. B. Pinson, who has had charge of the claim and service department, succeeds Mr. Vedder. C. B. O'Neal, who has been associated with Mr. Pinson, has been made manager of the claim and service department.

C. F. Young, for the past seven years assistant claim agent, Portland Electric Power Company, Portland, recently was appointed safety engineer for that company, a newly created position. Mr. Young was born in Minnesota in 1872, and at the age of fourteen came to Medford, Ore., where he completed his high school education. His first job in the electrical industry was in San Jose, Calif., as platform man in the street railway department. He spent some years in several California cities as cable car operator, motorman and conductor, un-



C. F. YOUNG

til in 1898 he moved to Seattle and went to work for the Seattle Electric Company, a forerunner of the Puget Sound Power & Light Company. There he remained for twenty years, spending the last ten years in the claim department, and in 1918 he became assistant claim agent for the Portland company. In his new position he will be concerned mainly with safety educational work among employees.

A. T. Lloyd, formerly representative of The Miller Company, Meriden, Conn., in Oakland, Calif., for Alameda and Contra Costa Counties, has resigned to join the sales force of the Maytag Company in the San Francisco Bay region.

Felix Van Cleef, member of the firm of Van Cleef Bros., Chicago, recently visited Los Angeles.

H. X. Sheeter, formerly of the Woodill-Hulse Electric Company, Los Angeles, has joined the sales force of the Pacific States Electric Company in that city.

Obituary

Willis T. Ryan, for the past five years industrial engineer, The Washington Water Power Company, Spokane, Wash., died March 2, 1926. Prior to his connection with the power company Mr. Ryan was chief engineer of the Union Pacific Coal Company, with offices at Cheyenne, Wyo.

Waldo G. Paine, vice-president and general manager of the Spokane & Eastern Railway & Power Company, died at his home in Spokane Feb. 20 from a sudden heart attack.



E. G. McCANN

man of the industrial relations committee of the Public Relations Section. While at Stanford University Mr. McCann was elected to membership in the engineering honor society, Sigma Xi, in recognition of his original research in connection with a thesis on "Corona Losses on High-Tension Transmission Lines."

TRADE NOTES

The Rainier Electric Bake Oven Company, Seattle, manufacturing the Rainier line of bake ovens, doughnut cookers and hotel and restaurant ranges, has moved into a new factory at 1425 Jackson Street. The new establishment is a two-story brick building of a size sufficient, with new equipment, to increase by four times the capacity of the old plant.

Reynolds Electric Company, Chicago, has produced the Reco unit flasher, which it is claimed by its manufacturers is a reliable motor-driven flashing mechanism, positive in timing, rugged in construction, small in size, quiet in operation, weatherproof, and easily installed. It is driven through a train of gears by a standard power motor. Bulletins describing this flasher may be had upon application.

Conger & Gerson, formerly of 549 Mission Road, Los Angeles, distributors of Savage washers in southern California, have moved into their new quarters in the Pacific Terminal Warehouse Building, 820 McGary Street. This will place offices, salesrooms and warehouse under one roof and will provide additional facilities for handling their increased business.

The Allied Metals Industries, Inc., is a new electric fixture industry in Inglewood, Calif. The large glassed-in plant covers a total of 25,000 sq. ft., and fixtures will be turned out complete from founding of aluminum parts to sprayed product.

Pittsburgh Transformer Company, Pittsburgh, has issued bulletin No. 2051, entitled "Pittsburgh Film Radiator for Transformers," which explains in detail the many advantages of the Pittsburgh film radiator, which the company claims is the strongest and most efficient means of heat dissipation that ever has been invented.

The Chicago Fuse Manufacturing Company, Chicago, now is packing its fuses in attractive 3-color counter display cartons. Each box tells how to protect lamps and appliances, what capacity to use and how to install a fuse. The company has issued a circular illustrating and describing the new carton.

The Korfund Company, New York City, has issued a new catalog entitled "How to Isolate Machine Vibrations." The subject is discussed in detail, and the catalog is illustrated with photographs and drawings.

The Monitor Controller Company of Baltimore, manufacturers of automatic controllers for all kinds of motor-driven apparatus, thermaload across-the-line starters and other products, has announced the establishment of a Pacific Coast representative, the Electric Material Company, with offices in San Francisco and Los Angeles.

Delco-Light Company recently conducted an intensive sales course in electric refrigeration in Denver in the interest of all of its Frigidaire representatives in the Mountain region. The school was held at the Albany Hotel and conducted by N. B. Acers, district manager.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, has issued a new publication describing Type CL carbon circuit breakers designed especially for 250-volt industrial applications where a compact breaker is required.

Cook Porcelain Insulator Corporation, Cambridge, Ohio, has appointed the Perkins Electric Equipment Company as its Pacific Coast sales representative, taking in the territory as far east as Salt Lake City.

Ajax Electrothermic Corporation, Trenton, N. J., is negotiating for the construction of a large plant and office building to occupy twenty-five acres of ground recently purchased for the purpose of taking care of its expanding business. The corporation manufactures high-frequency induction furnaces.

Bowie Switch Company, San Francisco has issued bulletin No. 16, describing the Bowie gang-operated, heavy-duty, high-voltage air-break switches, types G, GA and L. The bulletin is well illustrated with drawings and tables.

Ward Leonard Electric Company, Mount Vernon, N. Y., has issued bulletin 60 B, which is descriptive of its Vitrohm and Ribohm field rheostats. The bulletin is illustrated with photographs and contains complete price lists.

The Electric Controller & Manufacturing Company, Cleveland, has issued a leaflet on the use and methods of installing EC&M separator magnets. Photographs illustrate the leaflet.

Hubbard & Company, Pittsburgh, held their second annual sales conference of the electrical materials department recently.

Grisby-Grunow-Hinds Company, Chicago, has issued a folder descriptive of its new Majestic super-B current supply using the new Raytheon rectifying tube.

The Electric Vapor System Supply Company, Seattle, has moved its quarters to 513 Stewart Street, that city. Benjamin H. Petley is manager.

Pelton Water Wheel Company, San Francisco, has issued bulletin No. 24, which is descriptive of the Pelton types DS and ST pumps. These pumps are applicable in industrial service or in municipal water supply where large capacities or high pressures are to be handled.

Harvey Hubbell, Inc., Bridgeport, Conn., recently has brought out a canopy switch which is designed for fixture work and is particularly suitable for side-wall canopies and brackets.

The Cutler-Hammer Manufacturing Company, Milwaukee, has opened a sales office in the Healy Building, Atlanta, Ga.

American Ironing Machine Company, Chicago, has issued a small booklet in story-book form, covering its product, the Simplex ironer. Colored pictures illustrate its many advantages.

Square D Company, Detroit, has issued a small folder descriptive of the new Square D switch line. This folder describes and illustrates the Square D 40,000 series switches, which are designed for infrequent installations, such as disconnects, entrance switches, etc.

Detroit Stoker Company, Detroit, has issued a bulletin known as No. 103, describing the Detroit multiple retort underfeed stokers. The illustrations bring out many special features, such as the level fuel bed and the method for controlling movement of the fuel throughout the entire process of combustion.

Schutte & Koerting Company, Philadelphia, has appointed Herbert Lanyon, manufacturers' agent, New Call Building, San Francisco, as its California representative. Mr. Lanyon recently opened a branch office in Los Angeles in the Transportation Building with Ward B. Smith, electrical engineer, in charge.

Crouse-Hinds Company, Syracuse, N. Y., has issued a new folder covering electric signals for grade crossings and new types of traffic signals. The folder is illustrated with drawings and photographs.



What price goldfish bowls? That is what worries Bob St. John, the factory superintendent, as W. A. Cyr, the flashy salesman, tries to sell him a gold brick. Leo Gianini the progressive salesman, shows what he means by progressive, while O. K. Jones, the electrician, discourses on 60-watt lamps. And it all transpired at the Palace, in San Francisco, recently, during the presentation of "What Price Light?"

Journal of Electricity

Devoted to the Economic Production and Commercial Application of Electricity
IN THE ELEVEN WESTERN STATES

CALIFORNIA OREGON POWER COMPANY

Copco No. 2 Power Plant
Klamath River, California.

OKONITE CONTROL CABLES

used in Power House and
to control Head Gates at
Dam a mile away.



THE OKONITE COMPANY THE OKONITE-CALLENDER CABLE COMPANY, INC.

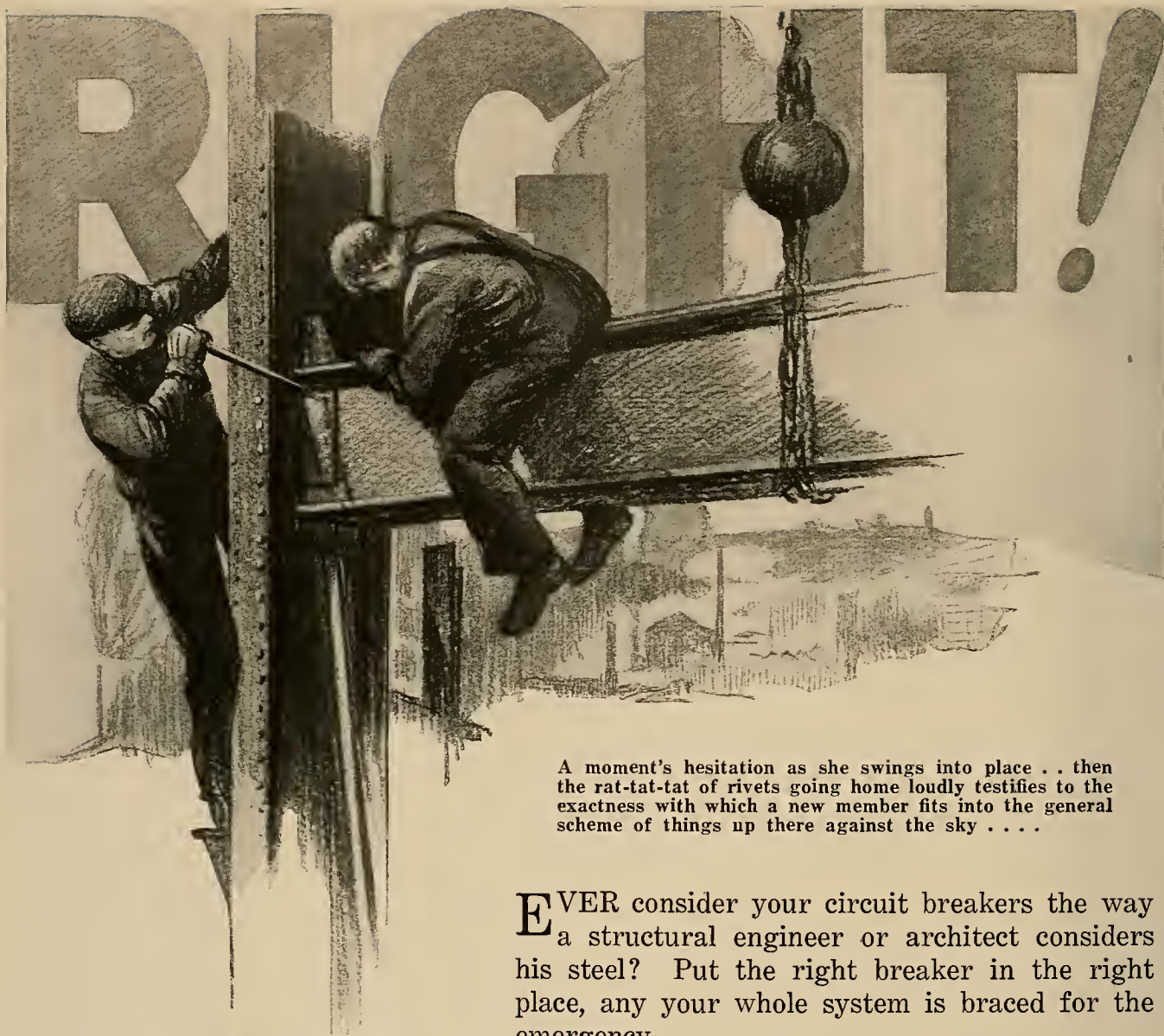
FACTORIES: PASSAIC, N. J. PATERSON, N. J.

SALES OFFICES: NEW YORK · CHICAGO · PITTSBURGH · ST. LOUIS · ATLANTA
BIRMINGHAM SAN FRANCISCO LOS ANGELES SEATTLE

Pettingell-Andrews Co., Boston, Mass. F. D. Lawrence Electric Co., Cincinnati, O.
Novelty Electric Co., Philadelphia, Pa.

Canadian Representatives: Engineering Materials Limited, Montreal
Cuban Representatives: Victor G. Mendoza Co., Havana

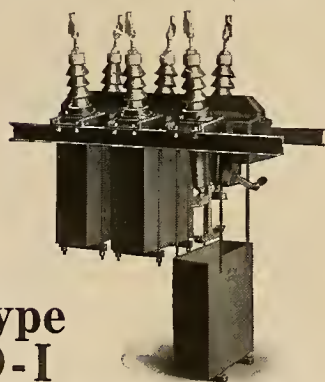




A moment's hesitation as she swings into place . . . then the rat-tat-tat of rivets going home loudly testifies to the exactness with which a new member fits into the general scheme of things up there against the sky

EVER consider your circuit breakers the way a structural engineer or architect considers his steel? Put the right breaker in the right place, any your whole system is braced for the emergency.

For moderate out-door interrupting requirements Condit Type O-1 is the right circuit breaker to use. The price is low enough to commend it to the most economical buyer. Condit quality of course—RIGHT in every sense of the word.



Type O-1

SPECIFICATIONS:

800 amperes or less, 15,000 volts; 600 amperes or less, 25,000 volts; automatic or non-automatic; electrically or manually operated. Interrupting capacity 2900 amperes at 15,000 volts.

"Get in touch with Condit"

CONDIT ELECTRICAL MFG. CORPORATION

Manufacturers of Electrical Protective Devices

Boston, Mass.

Represented by the H. B. Squires Co. in Seattle, San Francisco and Los Angeles

CONDIT

Journal of Electricity

With which is consolidated the "Electrical Journal" and the "Journal of Electricity, Power & Gas."
Devoted to the Economic Production and Commercial Application of Electricity
IN THE ELEVEN WESTERN STATES

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W. A. CYR, Associate Editor
B. H. SNOW, Northwest Editor

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NUMBER 7

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Inquiries from Fifteen States

SINCE the first announcement in the Journal of Electricity of the establishment of a department of correspondence instruction in public utilities at the University of Colorado by the Rocky Mountain Committee on Public Utility Information, inquiries have been received from no less than fifteen states, according to Prof. Elmore Peterson, head of the university extension division.

Both the university authorities and utility executives who are serving as members of the faculty in arranging and developing these courses express themselves as being not alone unusually gratified but also greatly surprised at the interest which already has been manifested through the original story appearing in the columns of the Journal.

Utility employees, engineering students, and others from every one of the eleven Western states have written to the university for information on these courses. Many letters have been directed also to the headquarters of the Rocky Mountain Committee in Denver, according to George E. Lewis, executive manager of the committee.

The purpose of the Journal of Electricity is to serve. To accomplish that purpose it works through many channels and in many different directions. The foregoing is but one instance of the kind of service it renders.

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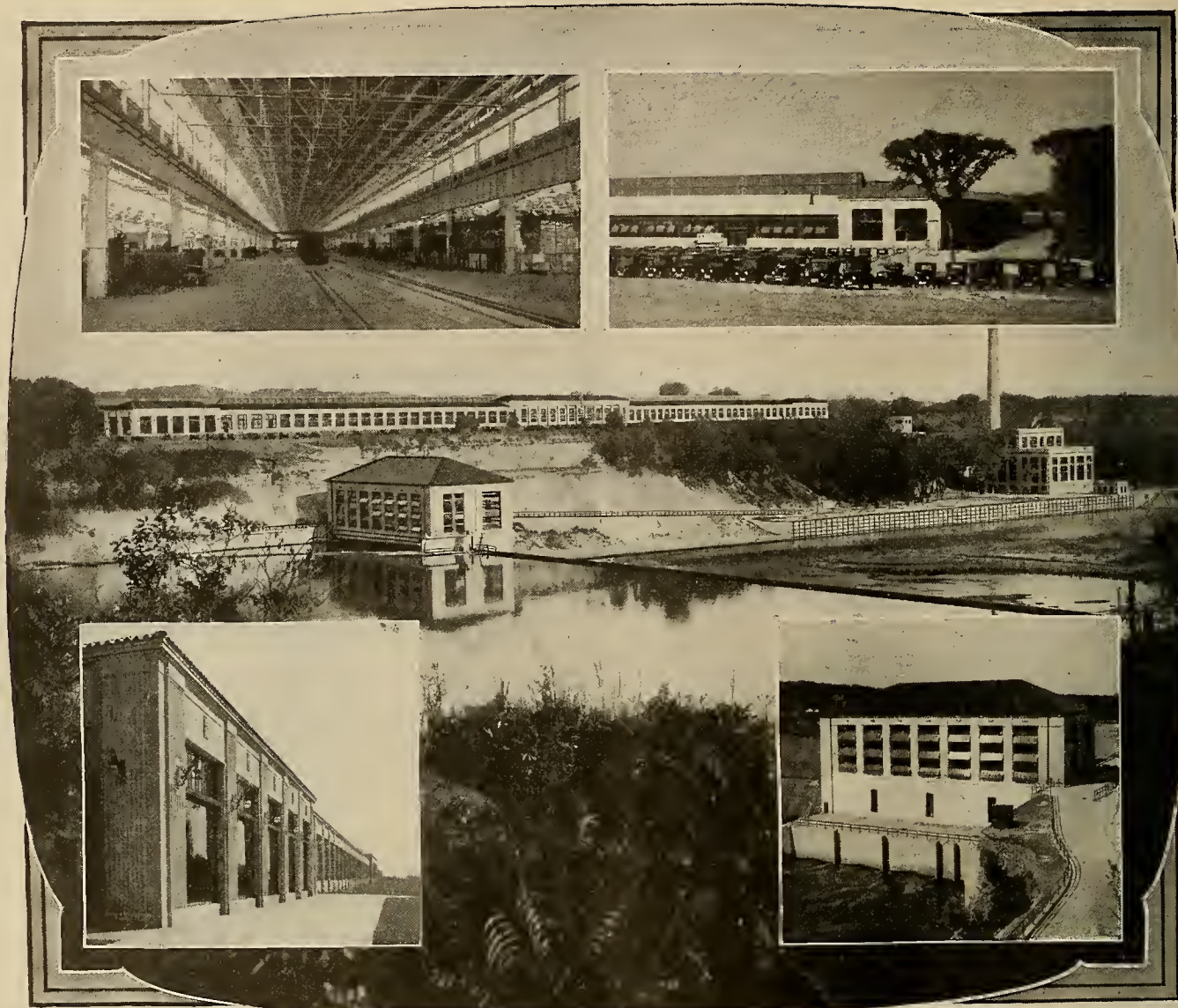
Engineering and Mining Journal—Press

Bus Transportation

Coal Age

Radio Retailing

Power



Ford Twin Cities Plant

IN this Ford manufacturing plant designed and built by Stone & Webster at St. Paul, Minnesota, the ground area of the single-story main building is nearly 20 acres* and the capacity of the power plants, one steam and one hydroelectric, on the Mississippi, is 25,000 horse power. Albert Kahn was Associate

Architect on the main building.

Materials for manufacturing enter the main building and are unloaded direct from the railroad cars. It is planned to have the finished product descend by elevator 100 feet to a terminal chamber and go thence by tunnel 700 feet to a boat landing for shipment by water.

*The building is 1400 feet long by 600 feet wide

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EDITORIAL

Yakima Listens to the Siren Song

ANCIENT folk lore, notably in the story of Ulysses, tells of a certain rocky shore, peopled by maidens of surpassing beauty and seductive charm, where mariners seldom failed to meet with disaster. Lured by the sweet songs of the Sirens and their promises of a beautiful life of ease and enjoyment, devoid of all care, these mariners turned their ships landward, oblivious of the treacherous rocks, only to be crushed upon them and their ships destroyed, themselves drowned.

So often is this situation repeated in various forms that the siren song has become known as a voice fraught with danger. In the political-ownership seas, especially, is the siren voice seductive, and it is a rare community which has not heard it at some time or other.

Just recently the little city of Yakima, Wash., was treated to a solo from the municipal-ownership siren, and lo, is said to have heeded the call to the extent of recommending that she change her course toward the rocks of municipal business enterprise. The gentleman who sang the sweet song is said by press reports to have "described the low rates of a number of cities which own their own power plants. He cited Cleveland and Springfield, Ohio; Jamestown, N. Y.; Ontario, Canada; and Seattle and Tacoma, all of which manufacture their own electric current and sell it to their people at half or less than the people here are able to buy it—."

Like most siren songs, half-truths abound in its lyric phrases. The beauty of the maidens—low rates—is made the burden of the song. But nothing is ever said about the rocks. The rocks of cold fact are ugly and do not fit into a charming song, but unfortunately they do snag many a municipal craft.

One of the underlying weaknesses of human nature is to be found in the desire to believe only the good, the true, and the beautiful when occasion sometimes calls for a stern facing of facts. We cherish fairy stories long after we boast loudly that we no longer believe in such things. The only difference is that we are apt, as human beings grown up, to select new fairy stories of life in some of its economic aspects to believe in. A siren song of "untold benefits" to be derived from political ownership of anything is very appealing to the imagination. Close scrutiny, which would denude such appeals of their glamor and reveal the rocks of which to be wary, is rarely exercised in such cases

simply because human nature so wants to believe its pretty fairy tales. That, too, is perhaps the reason why he who points a cold finger through the mist to the danger ahead is regarded as something akin to that terrible person who reveals to little children that there is no Santa Claus after all.

Storm Clouds of State Ownership Gathering Over Pacific Coast

BALBOA has been accused of having been uninformed when he named the ocean which laps the western shores of America the Pacific. He most assuredly was when the term is applied to the politics of those states adjacent to that body of water. Along with some of the soundest forms of legislation developed in this country has come some of the most bizarre and unsound ever to grace an election ballot. In this latter class fall those measures which have as their basis the theory that government should undertake the operation of such an intricate and technical business as the generation and distribution of electric energy. Yet notwithstanding the apparent fallacy and unsoundness of the proposals, in three elections during the past four years their proponents have been able to delude an increasing proportion of the voters into the belief that such a procedure has merit.

No "weather eye" is needed to see the storm clouds that are brewing over political camps in Oregon, Washington and California. Those utility executives who harbor the impression that the 1926 elections in these states will be without the biennial attacks on the light and power industry need but to listen closely to the political rumblings to have their sense of security at least shaken. California will have its Water and Power Act this year; Oregon already has its Grange Bill and Housewives Bill, both with the ordained purpose of placing the state in the power business; and Washington is threatened with some form of "free" power legislation.

The executive who feels that the movement on the Pacific Coast this year is not serious is laboring under a misapprehension. The danger of public ownership displacing private ownership will exist always, as it is the crux of the most persistent and vital issue that divides society today—the warfare between the socialistic and individualistic concept of the ideal social structure. For the next generation at least the public utilities will be the focal point of attack.

This year the protagonists of the measures find themselves strategically strengthened in their position to appeal emotionally to the prejudices and

fears of the public. Two popular misconceptions still will be the basis for the brunt of the attack. They are:

The belief that there is being given outright to the hydroelectric utilities for private exploitation natural resources of enormous value which should be retained by the people.

The belief that there is inherent danger to the public in a privately owned corporation, controlling great combinations of capital and the supply of an essential service—in other words, the instinctive fear of a great monopoly by the mass of people.

So far as the electric utilities are concerned there have been added to these two misconceptions two pronounced movements which will lend strength to the arguments of the proponents of this type of legislation. These movements are:

The unprecedented increase in the prices of the common stocks of the electric utilities which lately has taken place, with the implication on the part of many that excessive profits are being earned by those companies.

The development of the holding company, resulting in the concentration of large aggregations of capital and the rendition of electric service to great sections of the country by combinations of companies under a single financial control, thus giving alarm to those who fear a nation-wide "power trust."

On the surface it would appear that the case of the politically misguided few who foster legislation of this character has been strengthened materially. Those in the electric light and power industry know far better. Electricity is cheaper and service is better today than at any time in the history of the industry. And the trend is toward greater economies and lower cost to the public.

The problem of the industry is self-evident. Facts are available. Truth is truth. The task remains for these facts to be marshalled and presented to the mass of voters, who, it will be found, are an intelligent class, well able to think for themselves once they have been informed.

However, the task must not be delayed until a week or a month prior to election day. Work of organizing must begin immediately. Educational publicity must be started. The goal to be reached in November is such an overwhelming defeat to the various measures in those three states that their proponents will not dare again to initiate legislation assailing the light and power industry.

Approaching Sunlight as a Natural Limit

RATHER slow in its early development, the attention which has been focused on industrial lighting by the campaign just closed has begun to open up realizations of possibilities in this field before undreamed of. Cautiously feeling its way forward, this development of industrial illumination has been content with rather modest beginnings, but those in close touch with its possibilities now are pointing to even greater fields of sales

effort which should yield results of a magnitude that shall dwarf today's finest achievements.

One man, an executive of one of the largest manufacturers of lighting equipment for industrial applications, draws attention to what he terms the modesty of present standards as regards what is considered adequate illumination of industrial plants.

A job which will give the industrial plant a foot-candle intensity of from 10 to 13 foot-candles, today is considered to be the peak of achievement, he points out, and yet, compared to the illumination of sunlight even on cloudy days, this is woefully low. On a cloudy day the ordinary street will have an intensity of as high as 1,000 foot-candles, he points out, while on sunny days the intensity ranges from 5,000 or 7,000 to 10,000 or more foot-candles. The contention which he rightly makes is that central stations and contractors selling industrial lighting should not be content with anything less than from 100 to 150 foot-candles as a standard for adequate industrial illumination.

While this increased standard at first glance might seem somewhat of a big step, he bears out his statement with the fact that reflector and diffusion equipment for the elimination of glare even now is available for such intensities and has been designed to give the even distribution of light which is considered desirable by all illuminating engineers.

It is obvious at once that such a standard would result in benefits not only to the central station serving an industrial lighting load of such demand, but to the contractor who would install such a heavy-duty system, the jobber and manufacturer of the equipment, and of course the customer himself. Without this complete cycle of benefit, naturally, the plan would not be feasible.

It would seem that once the industry has started on a program to supplement the light of the sun after that important luminary has ceased his labors for the day it would do well to do a good job of it. A maximum intensity of 13 foot-candles in such a light is very feeble imitation and rather an admission of impotence. To approach more nearly the intensity of sunlight itself is merely to place the industry on a dignified basis of genuine assistant and not merely apprentice in this task of lighting the earth.

DISCUSSION

City Engineer Comments on Hetch Hetchy Construction Cost

To the Editor:

Sir—I appreciate very much the courtesy extended to permit me to comment on the statements contained in the communication submitted to The Journal of Electricity by Mr. C. E. Grunsky on the

subject of "The Cost of Power from San Francisco's Municipal Plant."

Mr. Grunsky's letter no doubt was inspired by the action of the San Francisco Board of Supervisors in establishing a figure of \$9,000,000 as the investment on which interest should be charged against the cost of power production by the Moccasin power plant, instead of \$21,000,000 as recommended by my office. This action of the board was taken after it had been clearly pointed out that the effect would be to make the cost of power production apparently very low and, if adhered to, the cost of water correspondingly high.

The Raker Bill, under which the grant of rights of way were obtained from the federal government, provides that in determining the cost of power production for sale purposes, the charge to power shall include a fair proportion of the cost of lands, dams and conduits, and the city engineer's figure was based on a 50 per cent division of the cost of all elements used jointly for water and power.

The purpose of the advocates of this low power charge was not to make the power appear cheap, but to enable them to divert the power revenue from its legitimate application to the payment of bond interest and apply it to the construction of an extension of the transmission line from Newark to San Francisco, thereby necessitating the payment of that portion of the interest charges from taxation.

I am in full accord with Mr. Grunsky in his condemnation of this proceeding and if he had confined himself to a criticism of these low false charges, I would not have felt called upon to reply to his communication. However, he follows this with a rather extended criticism of the program of construction of the Hetch Hetchy project on what he terms a large scale power and water development. He points out correctly that there has been built an 18-mile tunnel through the mountains from Early Intake to Priest forebay, with a capacity of 400,000,000 gal. of water daily (actually 500,000,000), with a power station and transmission line, together with the necessary storage at Hetch Hetchy Valley and Lake Eleanor, and that some \$6,000,000 has been invested in a conduit across the Santa Clara Valley to be used by the Spring Valley Water Company for the delivering of water caught in its Calaveras reservoir. He points out that the construction of these features of the project has exhausted the original bond fund of \$45,000,000, leaving the tunnel in the Sierra Nevada foothills, the pipe line across the San Joaquin Valley, and some 30 miles of tunnel through the Coast Range yet to be constructed. Certain of these features, particularly the 30-mile tunnel through the Coast Range, he points out were not contemplated in what is known as the original Garfield permit, upon the basis of which the original bond issue was voted.

Mr. Grunsky as city engineer and Mr. Marsden Manson, his successor, were the authors of a plan to bring into San Francisco some 60,000,000 gallons of water daily from the upper Tuolumne, which

development was originally estimated on the then current prices of labor and materials in 1908 to cost some \$45,000,000 and for the construction of which a revocable permit was granted by Secretary Garfield in that same year. Mr. Grunsky in his letter infers that a mistake was made in not developing the project on the lines originally advocated by himself and Mr. Manson. Mr. Grunsky's statement is not fair to those who have been responsible for the development program followed. He does not bring out the fact that immediately after the \$45,000,000 of bonds were voted in 1910, the Secretary of the Interior issued an order to show cause why this so-called Garfield permit should not be revoked and the city be required to develop some more available source of supply than the Tuolumne project. He does not bring out the fact that following this order to show cause the city was required to investigate and report on some fourteen or more different sources of supply, as to their availability, and that a board of United States Army engineers was appointed, which board, after reviewing all of these reports and making independent investigations, reported to the United States government authorities that the Hetch Hetchy project as now being developed was not only the most available but the cheapest source of water supply. This present plan was adopted on the recommendation of Mr. John R. Freeman, who made an intensive study of the entire project and in his report set forth fully the advantages to be derived from the development of this water supply on a large scale as against the 60,000,000-gallon development proposed by Mr. Grunsky.

Acting on the findings of this board of army engineers, who endorsed Mr. Freeman's report, Congress passed the Raker Bill, which made it compulsory for the City of San Francisco to develop the Hetch Hetchy Valley storage first by the construction of this dam to its present height and further required that electric power be developed in conjunction with the project, the first 10,000 hp. within three years and after the completion of any portion of the project suitable for the development of power, then in successive increments of 10,000 hp. until 60,000 hp. had been developed within twenty years.

Economical development of power under the provisions of the Raker Bill, as well as the protection of our water rights, dictated the construction of tunnels initially with capacity to carry the full amount of water required for the ultimate power development, and to carry the investment in the tunnel and dam it was essential, from an economic point of view, to construct the necessary power plant and transmission facilities and to utilize at the earliest date possible the full capacity of the tunnels so constructed, and our program of construction in the so-called Mountain Division has been completed along these lines. The net result is that approximately \$38,000,000, proceeds of the bond issue, have been spent on the mountain division, including the power development and transmission line, of which approximately \$21,000,000

is legitimately chargeable against power development, leaving \$17,000,000 for the water development in the Mountain Division; and the city today is receiving a gross annual revenue of approximately \$2,200,000, which after deducting expense of operation, maintenance and depreciation, leaves a net revenue of \$1,825,000, which is more than sufficient to pay the bond interest on the entire bond expenditure in the Mountain Division.

Mr. Grunsky's letter, by inference, seems to find fault with the construction of the so-called Bay Crossing Division of the Hetch Hetchy conduit crossing the Santa Clara Valley from Irvington to Spring Valley reservoir, constructed at a cost of approximately \$6,000,000.

He does not point out that if the city had not constructed this conduit it would have been necessary for the Spring Valley Water Company to have invested some \$12,000,000 in a conduit which, under their plans, would have been constructed at a higher level and which would not have been available for San Francisco's Hetch Hetchy supply in the event of acquiring the Spring Valley Water Company. He does not point out that under the arrangements made with the Spring Valley Water Company they have paid the city for interest during construction and will pay \$250,000 annually for the use of this conduit during a 10-year period, and that they have given to San Francisco an option during this period to purchase all the water-producing properties of the company, including 63,000 acres of land, at a figure of \$38,000,000, a price established some years ago by the California State Railroad Commission as the value of the property. The completion of this conduit and the additional development of the Spring Valley company's storage facilities will have made available for San Francisco some 24,000,000 gallons of water additional and have averted what otherwise might have been a serious water famine, and has extended for some six years the time when Hetch Hetchy water must be delivered into San Francisco.

Surely neither the cost of the construction of this conduit nor the Foothill and Coast Range tunnels, nor the San Joaquin pipe line, can by any stretch of the imagination be charged against power development.

The following is a quotation from a statement made by Major General Biddle of the United States Army, who, with General Taylor and Colonel Cosby, formed the board of army engineers who reported on the project, after a trip over the work:

I am very glad to say that, after ten or eleven years since our work (army board) was done, existing conditions have proved that the findings of the board were right. I am also very glad to say, after a visit to the valley, which I have just made with Mr. O'Shaughnessy that what we dreaded somewhat, the destruction of the great natural beauties, was not justified, and that the lake of Hetch Hetchy is today one of the most beautiful spots in the Sierras.

The work at the dam is completed. The dam itself is a completed structure, and the tunnels and other structural work have, in a large part, been completed. I am not in a position, having no figures, to state exactly what

the cost has been and how economically the work has been done. But from my general knowledge of engineering and my special knowledge of your chief engineer here, I feel absolutely certain that the work is first class. The work at Hetch Hetchy dam is a splendid monument to your engineer, which will last, I was going to say, for a thousand years to come—maybe two thousand. The work in the tunnels is equally good, so that I am sure the people here are going to have a great deal to be proud of each day for the manner in which this great engineering project is being carried out.

Of course, in all engineering work, especially tunnels, you find difficulties and unforeseen matters. Such things always have occurred and always will occur. It doesn't make any difference how much experience you have had, there is always something unexpected which adds to your cost. What your experience in that respect may have been, I don't know, but I do know and want to state without reserve, that, in my opinion, Hetch Hetchy is the best if not the only really available source of water supply for San Francisco and the bay cities, and especially for those cities as they shall be in the future and that the work that has been done is really a first-class job, in every respect, and that if you shall be fortunate enough to retain the services of Engineer O'Shaughnessy the remainder of the work will be equally well done.

Mr. John R. Freeman of Providence, Rhode Island:

December 17, 1925.

Mr. M. M. O'Shaughnessy, City Engineer,
San Francisco, California.

Dear Mr. O'Shaughnessy:

I thank you for remembering me with a copy of your very interesting report on the Hetch Hetchy project, bearing date of October 1925.

I am much interested to note that the income is paying interest on the cost of the investment to date.

Yours very truly,

(Signed) John R. Freeman.

Citizens of San Francisco are not worrying about the cost or the methods of construction, as witness the resolution passed by the members of the Chamber of Commerce who visited the works:

May 25, 1924.

First. That the work of constructing the remaining tunnels and pipe lines to bring the water into San Francisco should be undertaken and completed at the earliest date possible with due regard for efficiency and cost of construction.

Second. That His Honor, the Mayor, and the Board of Supervisors insist that, when the question of issuing bonds for the completion of the work is submitted to the people of San Francisco—through the ballot—the funds required to complete the water project, and the bonds required to handle the power project, be placed on the ballot separately and distinctly so that the voters of the city may have an opportunity to register their approval or disapproval of either, or both, propositions.

Third. That the Board of Supervisors of San Francisco officially extend an invitation to every San Franciscan to visit Hetch Hetchy; to go there and see for himself or herself the magnificent works that have been constructed, under the direction of Chief Engineer O'Shaughnessy; to determine whether the work has been necessary and whether it has been well done; and whether in his or her opinion it is advisable to complete the work and bring Hetch Hetchy water into San Francisco with as little delay as possible. The cost to the individual of this very wonderful and educational trip to one of the most beautiful spots in California is very modest, namely, about \$30, and is well worth while.

It is pertinent to say that by unanimous vote every person present assured Chief Engineer O'Shaughnessy of his admiration for his ability as a great engineer and his confidence in his integrity as a man, and expressed the hope that he would be spared to serve San Francisco in the future in the same loyal and unselfish manner as in the past, to the end that this great project for giving San Francisco an unlimited supply of pure, fresh water be carried to fruition under his guidance and in accordance with his plans.

Attached hereto is a list of the San Francisco visitors

to the Hetch Hetchy Project, who were present at the dinner at Cavagnaro Station, Sunday evening, May 25th, all of whom endorsed the above recommendation and authorized that this statement be made to the public of San Francisco in their name.

Yours very truly,
(Signed) Geo. M. Rolph,
Chairman.

It is regrettable that Mr. Grunsky should see fit at this date to raise these questions on the wisdom of a policy of construction which had been adopted some twelve years ago, following the most exhaustive reports of the most eminent engineers in the United States, which can serve no other purpose than to befog the public mind and tend to shake the confidence of the public in the value of this great project, especially where no constructive ideas are advanced by him for the completion of the project.

Fortunately many of the people of San Francisco have availed themselves of the opportunity of visiting the project and have seen for themselves the completed elements of the project as General Biddle has done, and they have not been misled by the direful prophecies of the calamity howlers, as is evidenced by their recently going on record by a vote of 20 to 1, for a \$10,000,000 bond issue for a continuance of the construction work, and this with a full knowledge that within a few years they will again be called upon for another bond issue of \$25,000,000 and later for \$38,000,000 to purchase the Spring Valley properties.

I enclose herewith a statement of expenditures on the project as recently published, which may be contrasted with Mr. Grunsky's \$60,000,000 figure; also a statement of revenue and operating expenses of the Moccasin power plant to Jan. 1, 1926.

Thanking you again for the opportunity to clear up the false impressions given by Mr. Grunsky's letter, I am

M. M. O'Shaughnessy,
City Engineer.

San Francisco, Calif., March 20, 1926.

ESTIMATED COSTS OF VARIOUS DIVISIONS OF THE WORK

Financed from Bond Issue of 1909 and 1910, and General Fund expenditures previous to 1909.

MOUNTAIN DEVELOPMENT

Hetch Hetchy Division	
O'Shaughnessy dam, clearing of Hetch Hetchy reservoir	\$ 7,400,000.00
Eleanor Division	
Eleanor dam, clearing of Lake Eleanor reservoir	373,000.00
Mountain Division	
Early Intake diversion dam and spillway and headworks of aqueduct	\$ 610,000.00
Aqueduct tunnels and appurtenances, Early Intake to Priest reservoir (18.84 miles)	10,100,000.00
Total	10,710,000.00

Moccasin Division	
Priest dam and reservoir.....	\$ 930,000.00
Moccasin tunnel, from Priest reservoir to head of penstock lines	1,200,000.00
Penstock lines	2,000,000.00
Power house building, dwellings, school, etc.	1,200,000.00

Power house machinery	1,135,000.00
Transmission line, Moccasin to Newark	1,623,000.00
Total	\$ 8,088,000.00

Foothill Division	
Red Mountain Bar Siphon.....	262,000.00
General, Utilities, Etc., on Mountain Development	
Sawmill construction and operation	\$ 556,000.00
Lower Cherry power system, construction and operation.....	1,079,000.00
Hetch Hetchy railroad, construction and operation.....	5,379,000.00
Munn sand plant, Groveland water supply, etc.	77,000.00
Hospital, construction and operation	221,000.00
Miscellaneous structures, water supply at Groveland	196,000.00
Miscellaneous roads, trails, camps, etc.	369,000.00
Boarding house loss	360,000.00
Field engineering and administration	381,000.00
Total	8,618,000.00

Total Mountain Development	\$35,451,000.00
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Bay Development	
Riveted steel pipe line, 60 inches diameter	\$ 2,408,000.00
Trestle for steel pipe line.....	198,000.00
Submarine pipe lines	599,000.00
Steel bridge and piers	1,560,000.00
Gate valves, bay Pulgas pumps, etc.	39,000.00
Pulgas Tunnel	757,000.00
Field engineering and administration	93,000.00
City office engineering and administration	42,000.00
Total	5,696,000.00

General	
Administration, engineering, legal, etc.	\$ 1,415,000.00
Reservoir and watershed lands, water rights, rights of way, payments to U. S. government, etc.	2,020,000.00
Lands and rights of way, San Joaquin Division	215,000.00
Lands and rights of way, transmission line	117,000.00
Lands and rights of way, Bay Development	221,000.00
Miscellaneous	322,000.00
Total	4,310,000.00

Total Expenditures	\$45,457,000.00
Less credit for receipts from operation of Hetch Hetchy railroad, Lower Cherry power system, lumber sales, etc.	1,907,000.00

Net total expenditures after deducting credits, which may be still further reduced on final accounting by salvage value of equipment now on hand.....	\$43,550,000.00
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MOCCASIN POWER REVENUE AND OPERATING EXPENSE

By Months			
From Aug. 16 to Dec. 31, 1925			
Month	Gross Revenue	Operating Expense	Net Revenue
Aug. (15 days).....	\$ 88,555.87	\$ 6,695.80	\$ 81,860.07
Sept.	182,426.98	13,399.48	169,027.50
Oct.	204,905.46	20,131.74	184,773.72
Nov.	186,070.22	19,614.02	166,456.20
Dec.	196,663.35	18,954.44	177,708.91
Total, 4½ mos.....	\$858,621.88	\$ 78,795.48	\$779,826.40

THE Mormon Flat dam and power house are being constructed through the co-operation of the Salt River Valley Water Users' Association and the Central Arizona Light & Power Company. The project is located on the Salt River in Arizona and is a part of the extensive irrigation and power development in that section of the state. The arch dam, 150 ft. high, will impound 90,000 acre-ft. of water. The power house will contain two 7,000-kw. generators which will operate under a variable head ranging between 70 and 150 ft. Plans call for the completion of the project early in May. At the time the photograph was taken machinery was being installed in the power house.



Edison Goal for 1926 Is 200,000 Hp. of New Business

By A. W. Childs

General Sales Manager, Southern California Edison Company, Los Angeles

WITH a merchandising plan designed to have a constructive and stimulating effect upon appliance sales as a whole in the territory served and to give greatest possible assistance to the dealer, the Southern California Edison Company expects to add 200,000 hp. of new business to its lines during 1926. The company's plans call for the division of this total load as follows: domestic and commercial lighting, 55,000 hp.; cooking and heating, 40,000 hp.; power, 105,000 hp. In terms of appliances the minimum sales expected for the current year are 3,000 electric ranges, 1,600 electric water heaters, 2,200 refrigerators and 20,000 miscellaneous small appliances.

The Edison company's merchandising program is based upon several fundamental principles. Its officials believe that there are two paramount reasons why the sale of appliances should be conducted on a merchandising basis. The first reason is that the power company should co-operate with the dealer and not engage in unprofitable ventures. The second is that there should be a margin of profit sufficient to cover fully the actual selling expenses of the merchandise distributed because it might be said that a part of the burden of selling the appliances to some consumers had to be borne by other consumers not interested in the sale of these devices. The Edison company's program calls for the working with and co-operating in every way with the dealer and contractor.

Furthermore, it is the company's belief that in order that the public may receive all the benefits to be derived from electric services there must be many ways for the consumer to obtain those electric appliances which lighten labor and bring joy to homes. The more channels available, the sooner, will the public be benefited. The contractor-dealer has opportunities which are peculiar to his business, and the power companies should realize that assistance given the dealer will benefit all concerned. Moreover, the more such appliances and devices are sold, the more work there will be for the contractor-dealer in the installation of wiring, fixtures and other material to enable the appliances to be put into service.

CO-OPERATIVE program of the Southern California Edison Company calls for sale of 3,000 electric ranges, 1,600 water heaters, 2,200 refrigerators, and 20,000 miscellaneous appliances. Dealers and contractors are to benefit to the fullest extent from this constructive program, which includes the formation of an acceptance corporation to handle time-payment paper.

The company also believes that for the larger appliances such as ranges, water heaters, washers, refrigerators and devices requiring technical skill servicing by the central-station company is necessary. A power company should have competent men for this work. The consumer should be saved needless delay and the cost of servicing should be kept down to a minimum.

In its desire to keep well abreast of the times and of the requirements of the electrical industry, the Edison company has become affiliated with an acceptance corporation as a part of its commercial program for the purpose of handling time-payment paper, both for the company and all electrical dealers in its territory. The company feels that this connection should be beneficial not only to consumers but to all branches of the industry interested in the manufacture, distribution and sale of current-consuming devices. This plan will be of great advantage to the progressive dealer whose capital is limited. If he sells an electric refrigerator, he retains the down cash payment and then may turn over his contract covering the deferred payments to the acceptance corporation and receive from it the balance of the purchase price. This enables the dealer to make the sale, obtain the full profit on the appliance sold, keep his capital employed in active stock and relieve him from the expense and trouble of collecting the deferred installment payments. The dealer's responsibility in connection with the sale is not ended until the customer makes the final payment upon the appliance purchased. The acceptance corporation will handle time-payment contracts on ranges, water heaters, refrigerators, washing machines and vacuum cleaners where the sales price is \$50 or more.

The Edison company's own merchandising program is divided into two parts. The first covers the sale of heavy-duty appliances, such as ranges, water heaters and refrigerators. These appliances will be on display in all of the company's sixty-four district offices and sub-offices. Sales will be made by an organized staff of fifty trained men in the field and twenty saleswomen in the offices.

The Modern Method of Refrigeration is now practical for every home using Edison Service

Use Electrical Refrigeration



THE Southern California Edison Company makes available a complete line of electrical refrigerators which are thoroughly tested and backed by the Edison assurance of satisfactory service. They are on display in every Edison office. Even if you do not contemplate an immediate purchase it will pay you to see Easy Buttons' latest contribution to the home, to observe the many things that it will do and learn how easy it is to secure one.

THE SAME fine refrigerators which are used so successfully in markets and shops—hotels and clubs—are now made in smaller sizes especially suitable for California homes. Any home with electric lights may have this new convenience which before long will be considered a real necessity.

Not a Substitute for Ice, but an Improved Method of Refrigeration

The vacuum cleaner is not a substitute for the broom, nor the automobile for the horse. These modern devices are vastly superior to old-fashioned methods. The same is true of the electrical refrigerator.

Cleanliness Never Before Possible

The distinctive feature about electrical refrigeration is that it is DRY. And a dry refrigerator is clean.

Food Remains Fresh

In a constant, low temperature food keeps fresh much longer than in a varying temperature.

Many Foods Actually Improved

Meat that has been thoroughly chilled is more tender and has a finer flavor. Lettuce, celery and fruit from the electrical refrigerator make better salads.

Nothing to Watch, Not Even a Switch to Remember

All that is necessary is a light socket or a convenience outlet.

Power turns on and off automatically as temperature rises and drops. "Install it and forget it."

And Yet Its Cost is Low

Edison experts have investigated reports of several thousand homes throughout America where Electrical Refrigerators are used. In nearly every case the cost of operation is less than the cost of ice.

You'll be proud to own this modern household delight

The Electric Refrigerator is thoroughly constructed, bright clean, shiny appliance which would cherish for its beauty alone. Your friends will admire it, and you will be happy.



Every Home Should Have a Washer and an Ironer



These are two appliances which have taken most of the drudgery out of housework.

\$10 Down

will put one in your home. The balance can be paid while you are enjoying the use of the machine.



ELECTRIC WASHERS & IRONERS

Either the washer or the ironer will be demonstrated for you at our office.

Both carry the Edison guarantee as well as that of the manufacturer.

Southern California Edison Company

Electrical Refrigeration for your home..



what is it?
what will it do?
what is the method?
what does it cost?

These are the questions which everyone is asking about domestic electrical refrigeration--the new method of keeping food sweet, cold, clean and dry. We cannot tell the whole story in this space but here are the answers to the above questions.

What it is.. Refrigeration without ice. That is the story in three words. When you put this modern device in your house and turn on the current, you are through. Electricity does the rest. It is automatic. It looks like a refrigerator--it is a refrigerator--but it requires no ice.

What it does.. The electrical refrigerator is a complete unit. By electric power it makes cold--as low as 18° in the cold chamber and ranging from 40° to 50° in the food compartments. These temperatures are constant. It makes cubes of ice for table use. It makes ices. It makes sherbets. It makes frozen puddings. It gives complete refrigeration.

What the method is.. The instructions for operating an electrical refrigerator are simple and amusing. They consist of three words, "Leave it alone". Just turn on the current--the rest is automatic. Go away for a week--or a month, the box will be cold, sweet and dry when you return.

What it costs.. Probably less than you have been paying for ice. This is our conclusion after investigating the reports on several thousand installations throughout America.

For complete information, inquire of your dealer or the nearest office of

SOUTHERN CALIFORNIA EDISON COMPANY

Owned by those it Serves

Isn't it Snuggly these Mornings?



An electric heater in the bed-room and another in the bath room will quickly take the chill off the air.

NO FUMES • NO FLAME
CONVENIENT • PORTABLE
Ideal for Baby's Bath

This is the Edison heater, (made by Hotpoint) Copper reflector, removable wire guard, ornamental base, adjustable to any angle--complete with cord and plug to fit any socket. This is an unusual value at

\$6.50

Also a smaller size at \$5.00

SOUTHERN CALIFORNIA EDISON COMPANY

Owned by those it Serves

Special for **JANUARY**

THIS splendid Edison heater (made by HOTPOINT) will be featured in all of our Offices as a **\$5.95** CASH CARRY January Special at

SOUTHERN CALIFORNIA EDISON COMPANY

Electric IRON \$3.75
Special for FEBRUARY only



STANDARD 6-pound Edison Iron (made by Hotpoint). We are especially able to offer this special cash-and-carry bargain to our customers at this remarkably low price.



Southern California Edison Company

Samples of the various advertising being used by the Southern California Edison Company to promote the use of electric appliances in its territory. The samples show broadsides, bill stuffers and newspaper advertisements.

All types of appliances in this class will be sold at manufacturer's list price. Time payments will be handled on a basis of six, twelve and eighteen months on ranges, water heaters and refrigerators.

In connection with its refrigerator merchandising the company will sell completely equipped cabinets only. If a purchaser wishes to install a refrigerator unit in an old ice box the sale will be turned over to a dealer. An attractive plan has been worked out whereby contractor-builders engaged in the construction of groups of homes or apartment houses will be able to purchase refrigerators on a discount basis, discounts allowed being the same as those allowed by other refrigerator distributors. Discounts will depend upon the number of refrigerators purchased and will be determined on the last machine purchased, just as lamp and other quantity purchases are arranged. This plan is working successfully already and a number of blocks of machines have been sold to contractor-builders for installation in new homes.

As a preferred list of refrigerator prospects the company has its electric-range consumers upon whom sales attention is being concentrated on account of the low rate they will enjoy for this class of service. Of three sales letters regarding refrigerators that are being sent out, one which is directed primarily to those consumers who enjoy combination lighting, cooking and heating rates follows:

Mrs. J. D. Speer,
Pomona, California.

Dear Mrs. Speer:

Electricity, which has done so much to make housekeeping a delight, is now ready to go further and take care of all of your refrigeration requirements.

An electrical refrigerator—clean, sweet, and positively cold—working automatically—is more than a substitute for ice. It gives you that perfect refrigeration which you have observed in high-grade shops and markets.

Best of all, the cost of operation is low. In any case the electric bill will probably be less than has been paid for ice. Under the special rate you enjoy with your electric range, the cost for electrical refrigeration will be practically nominal.

Our representative will call in a few days and we are sure you will be interested in what he has to say.

Very truly yours,

District Manager.

To educate the housewife in the advantages of electric cookery, fourteen cooking schools will be conducted in the company's territory. These schools are fostered through the co-operative efforts of the local newspaper, the central station and the Edison Electric Appliance Company. They are designed to sell the housewife not only the advantages of the electric range but also of the electric refrigerator, vacuum cleaner, washing machine and ironer as well.

Two highly successful cooking schools already have been held. At Santa Paula, in co-operation with the "Santa Paula Chronicle," a school was held from Feb. 16-19 at which 950 women attended and 60 participated in the baking contest, in which prizes consisting of an electric range, an ironer, a vacuum cleaner and small appliances were given. At Redlands between March 2 and 5 a total of 1,615 women attended a cooking school and 325 participated in the baking contest.

Merchandising Small Appliances

In co-operation with the electrical jobbers and dealers in its territory the Edison company has worked out a plan of merchandising one small appliance each month. Consumers are offered an appliance at a special price for a period of one month, during which time a large amount of advertising is done both by the Edison company and the jobbers. Dealers participate in the campaign on the same basis as the power company. The plan was worked out after careful study by company officials, the jobbers and the merchandising committee of the Southern Division of the California Electragists. The program for the first half of the year follows:

January	Air heaters
February	Irons
March	Toasters
April	Percolators
May	Table stoves
June	Waffle irons
July and August.....	Ranges

The committee in charge of these special campaigns adopted waffle irons for June because it was of the opinion that a waffle iron makes an ideal gift for the June bride. In the case of ranges no special price will be made to the consumer although it is possible that ranges will be offered at exceptionally advantageous terms. It is hoped that by concentrating on ranges for two months considerable encouragement can be given to the dealers to merchandise this appliance.

After July it is hoped that the plans of the merchandising committee of the N.E.L.A. will be announced so that the sales activities in southern California can be tied in with them. If not, it is possible that some of the items featured during the first half of the year will again be made the subject of special campaigns in the fall.

Advertising and Publicity

The advertising program which will be used to stimulate public interest in the appliances being offered by the Edison company consists of newspaper advertisements, broadsides, bill stuffers and sales letters. Two special refrigerator broadsides will be used. At the present time 200,000 bill stuffers are being sent out monthly. General appliance advertising will tie in with the electrical dealers in the territory by saying, "See your local dealer," thus aiding dealers as well as the company. The advertising appropriation will be spent in 165 newspapers. All classes of advertising reach a considerable sum of money.

The Edison company's entire merchandising program has been designed to have a constructive and stimulating effect and at the same time to assist the electrical dealer to the greatest possible extent. Load-building is its foremost aim. The plan has been in effect sufficiently long to demonstrate the wisdom of the policy adopted, and a big load-building year throughout its territory is expected by the company.

Relation of Public Service Men to Public

By Franklin T. Griffith*

President, Portland Electric Power Company, Portland

THE relation of public-service men to the public should be a most intimate one. It should be based upon the proper conception of the element "service" involved in our business. Employees generally, those engaged in public service in whatever capacity, as I see the picture, should realize that we are, in the truest and perhaps one of the highest senses, public servants. That conception should be thoroughly impressed upon every man and woman in the public-utility game. It should never be lost sight of for a single moment that our job is to do everything we can for the people we serve, because by serving the people we succeed or we fail. There is no such thing as going backwards in this business; it is not like some other branches of public service with which I am familiar, which may pause for a period of time and then may gain headway again, or fail entirely. In this industry we are going ahead steadily by tremendous leaps, and if we progress as we all believe and hope we should, we must not lose sight of the fact that our growth, our success, depends, even to a greater degree than on the efficiency technical men may bring into our affairs, upon that most powerful thing, the good will and the confidence of the people.

The Catch-Phrase Evil

Perhaps no statement true or false ever had a more disastrous effect on the public service of this country than the one allegedly uttered many years ago, "The public be damned!" How many times have you—and many of you are younger than others of us—in your short lives heard that expression referred to? Even to this day there are a great many that believe that expression typifies the attitude of this industry toward the public. You men, your executives, your accounting men, I hope, realize that one of the great problems of public service today is to disabuse the public mind of the evil effects of that phrase, which, I believe, Cornelius Vanderbilt never uttered. We must devote our time, our thoughts, our energies, in building up the respect and the confidence of the public in our industry.

MR. GRIFFITH recently in Seattle gave the engineers of the Northwest something to think about. Because of its inspirational character, because it presents so forcibly a number of subjects of interest over our entire territory, his address will find a welcome reception from a great number of our readers. Through the courtesy of Mr. Griffith and the Technical Section of the Northwest Electric Light and Power Association, we are able to present it herewith.

We have made some headway in this direction through our customer-ownership activities, which are producing a true public ownership. Public ownership does not mean simply getting the money of the people invested in the corporation. It means trying to make each stockholder a real participant in our business. It means trying to get over to him the conception we have, making him understand and believe we have it in our hearts to conduct an honest business in an honest and efficient way. That is one of the great

problems of this particular group of men. Advantage must be taken of every advance in the progress of the art, using it to better the service we render to the customer and the owner. That is your job, and you must not lose sight of it for a moment.

Government Ownership

One of the things facing us today, perhaps that which is of the greatest importance in its effect on the future, is the spread of popular sentiment in favor of government ownership.

Sentiment for government ownership, or municipal ownership, does not exist with anything like the same enthusiasm in those districts where power is produced by steam as in those where water power is abundant. There is something about hydroelectric power that appeals to the imagination. Those who believe in the desirability of government ownership either because they are honestly convinced or because they think there is something in the way of personal advantage to be obtained, seize this opportunity to appeal to the imagination of the uninformed. They talk about the great hydroelectric possibilities of this great West—and out here we do have these potential powers in far greater profusion than anywhere else. They say, "This great gift of free power is yours. Do not let the grasping hands of the powers of monopoly take from you that which is God-given to all, that which should be worked for all and served to the people at cost without profit to any one."

That makes a nice appeal to the man who thinks water power is something to be created out of nothing, that is, that it is cheap—and these proponents constantly talk about the cheap power

*Excerpts from an address before the third annual general meeting of the Technical Section, Northwest Electric Light and Power Association, Seattle, March 11-12, 1926.

to be derived from the development of the great resources of the West.

Cheap Power and Industry

I read every day or so in the newspapers some article upon the development of power by the people and for the people. I read the other day the claim that cheap power when developed here in the West would bring in its wake the greatest industrial development ever known or conceived by man. All that we need is power developed by the state or the municipalities to bring all the great industrial men and the great industries of the East out here to use that cheap power.

In this same article illustration was made of what has happened in Los Angeles, citing that in 1890 it had a population of 62,000 and Portland had 90,000, while today it has three or four times the population of Portland. Much of that great growth was attributed to the fact that Los Angeles had cheap power because the city has engaged in the power business and has made available the blessing that God had given the city to all who chose to come and locate there. The article made a great point of the fact that the residents of Los Angeles can get their energy at 5.6 cents per kw-hr., while the manufacturer, under certain conditions, may get it as low as $3/5$ of a cent per kw-hr., pointing to this cheap power as being the mainspring of the industrial development of that city. That was the claim made, and yet in Seattle and in Portland, and in fact in many cities in these Northwest states of ours, energy can be, and is being, purchased and used by all the people at rates lower than those given in Los Angeles.

Los Angeles—Portland—Tacoma

What are the facts about these rates? Take the situation in Portland—and you have similar rates also right here in Washington—we have a rate in Portland which compares favorably with the $3/5$ -of-a-cent rate in Los Angeles. Any customer in Portland who wants to use 4,000 hp. may buy it on an annual basis at twenty-seven dollars per horsepower-year. That is about four mills, or $2/5$ of a cent per kw-hr., one-third lower than the rate quoted as being the mainspring of industrial development in the city of Los Angeles.

There is a municipal plant in Tacoma, perhaps one of the earliest, most successful and best managed municipal plants that we know about. It furnishes power at very low rates and yet what has been the industrial development of Tacoma in all the years it has supplied this cheap power? The fact is that Tacoma has shown less growth, proportionately, than any other city in the Northwest in the last twenty years. I cite that for the purpose of showing that this talk about cheap power bringing industry to a community is false, and that cheap power is not the mainspring of industrial development. It does not bring industry. It is an element to be considered in the establishment of any new industry, that is true, but it is not an important element in many industrial plants.

How many of you know the results of the governments census investigation of power? As long as ten years ago rates were at least ten per cent, on an average, higher than they are today, yet the cost of energy represented less than two per cent of the cost of manufactured products of 114,000 establishments in these United States. How large an element is that in determining the location of an industry? This talk of cheap rates bringing industrial development is all thin air!

Other elements are far more important. The availability of labor supply, the cost of labor, the market for the finished product, the availability of the raw materials to be used, the tax question—any of these is of far greater importance in the location of industry than the cost of power. Continuity of supply of energy is far more important than the cost of that energy. What the manufacturer wants to know is that his wheels will not stop because of a shortage of power. He wants to know that there is a supply of good service that will continue, and that that element may be forgotten as far as he is concerned, once his equipment is installed. I submit that under public service as conducted by private ownership there is that continuity of service, which ought to be far more satisfactory to any user of power than any service political management can render.

State Power Proposals in Oregon

We have in Oregon a fight more serious than that in Washington last year—more serious than that fought twice in California—because the two proposed measures our people are being called upon to consider are more drastic. For the benefit of my Oregon friends perhaps more than the rest of you—and yet, if you others are not familiar with the situation, I think it would be interesting to you as members of this great public service industry to acquaint yourself with it—I want to tell you about the two bills proposed there. Washington had one fight and won it, but it will have others. I am not speaking pessimistically; I do not fear the outcome; but I believe that forewarned is forearmed, and many of the arguments and answers are common to the situation as it might develop in any state or any locality.

The "Housewives" Bill

Portland has an organization called the "Housewives' Council." Housewife Dan Kelleher, Housewife George Joseph, and others compose this organization, and these housewives in pants have drawn measures for which they are now obtaining signatures from the people of Oregon for the purpose of placing them on the ballot at the November election.

Their bill provides, roughly and generally: That a commission consisting of housewives Dan Kelleher, Waldo Anderson, Kate Bonham, and two others shall be created and called the "Hydroelectric Commission of Oregon"; that this body with all its wealth of experience and knowledge of the business and its wonderful ability to grasp financial problems of great magnitude, shall have the power,

without veto anywhere, without control by any person, body or other organization, to bond the State of Oregon, obligating the full faith and credit of the state up to five per cent of its assessed valuation, which, under the present valuation, would be about fifty-five million dollars; that they may use the money so raised for the purpose of developing the latent industry of the state, consisting of hydroelectric power; that, in addition to this power to issue general obligation bonds, they may issue public utilities' certificates without limitation whatever as to the amount, using such certificates for the purpose of acquiring by construction, purchase, or otherwise, any utility or new plants they wish; and that they may do almost anything they deem necessary to carry out the purposes of this act.

With these powers they might condemn the property I represent, if they so desired. They might mortgage it for such an amount as it would be reasonable security for, such mortgage, or the bonds issued therefor, being secured only by the property. They might say fifty or seventy-five per cent of the cost of condemnation or purchase is to be financed by utilities' certificates—and they have that power—and the balance of the money necessary to condemn or acquire could be covered by issuance of bonds of the State of Oregon pledging the credit of the state up to fifty-five million dollars.

They may, under this bill—this same group of housewives—withdraw from entry every drop of water not now developed in the State of Oregon. They may make such developments, where, as, if or when they please; they may acquire, if the law is upheld—and there is some question about that from a legal standpoint—a portion of any existing system, if necessary to complete such plans as they have in mind for development of their own scheme. Now this power will be vested in this group of housewives. They serve without compensation, purely for the love of it, but they have the power to create boards of their own choice, employ whom they please and fix compensation for the positions on such boards. There is no limit to the power they ask, and it may be seen that it is one of the most drastic measures for the expulsion of private ownership and the creation of new indebtedness ever conceived by man and imposed on an intelligent public.

The Grange Bill

Such is one of the bills we have to fight. The other is fostered by the state grange, of which our governor is a member. The grange believes our farmers have not had proper treatment; believes there is truth in the doctrine preached by Carl Thompson and others, who have advanced fallacious theories of public service. It believes that if the state goes into the power business the farmers will get their energy at half the cost now being paid; that they will heat and light their homes electrically, operate all of their equipment electrically; and that they will get this energy at such low cost it will mean nothing to them.

The grange proposes that before the state en-

gages in this business there must be a constitutional amendment authorizing the state to do so, and it proposes a well-drawn amendment giving the state that power. In order to make that amendment effective, if adopted by the people, it proposes a bill similar in character to that proposed by the housewives, with this exception: that the power to bond the state is limited to four per cent on the grange bill against five per cent on the housewives' bill, and the members of the commission, with the exception of the state engineer, shall be appointed by the governor and continue in office until removed by the governor. There is one other provision in the grange bill not in the housewives' bill, and that was inserted rather cleverly, that all property acquired under the bill shall be subject to taxation. Thus will be met the argument that public service property pays taxes and supports the government; it will be contended that if the state engages in the business it will not add taxes to the present burden. This provision was put in the bill for the sole purpose of meeting objections from the power interests.

Now I ask you, gentlemen, as members of this great fraternity of ours: Do you conceive any obligation resting upon yourselves, individually as well as collectively, to combat such policies? If you do not believe in the business you are engaged in, get out of it! If you do not have confidence in the company you are employed by, leave its employ! If you are true and loyal to the cause you represent, you will conceive you have a definite obligation resting upon each and every one of you to remove the misapprehension of the people as to the facts; you will combat these policies as a social matter, as a matter of political economy, as a matter of differentiating between communism and republicanism.

Inspiration in the Hope of Reward

There are two great powers in this world, two of the greatest powers governing the behavior of men: first the fear of punishment; second, the hope of reward. Take from society those two great powers and you have an unleavened mass.

Where have you found anywhere, anything other than a plain level of operation under government service, or government ownership? True, you do find the occasional man standing out by himself, who, by reason of a high sense of obligation to public duty, undertakes operation of public enterprise. The rule in private ownership is that every man is striving, selfishly, if you please, realizing that by his own initiative, ambition and energy, he will climb farther and farther up the ladder of success, and be rewarded in proportion. It is this selfish motive that has made America industrially great.

The Example of Ontario

In this campaign in Oregon many, many times, you'll have thrown at you the example of Ontario. You hear of this wonderful experiment of the Hydroelectric Commission of Ontario, touted as a shining illustration of the possibilities of successful

operation of governmentally owned enterprises. Now is it? Is it that, or is it something entirely different? If you believe one branch of the public press lacking knowledge of the innermost facts concerning it, you will say it is a successful experiment. It is true that in many places in Ontario the rates for domestic service are lower than on the American side of the line. The contrary is true also that in seventy-four of the communities the rates are higher for domestic service than in any place in Oregon, Washington or California. The rates are not uniform. On a general average the rates for power are greater than on the American side of the line for similar load.

Two hundred forty million dollars of the Ontario Province money has been spent on this great project, and they say they pay taxes on this property. They pay taxes on ten million of that two hundred forty million dollars, and this furnishes the basis for the claim that they do pay taxes. They pay taxes on one-twenty-fourth!

Give God Credit for Niagara

The whole Ontario project is based upon a gift of God to man second to none that He in His reign has ever given—the Ontario development at Niagara. Let me tell you briefly what this is, though you may know it already. The Niagara River is less than thirty miles long. It is simply a connecting link between Lake Erie and Lake Ontario. The four Great Lakes of Superior, Michigan, Huron and Erie have a drainage basin of 263,000 sq. miles. All of the water, with the exception of 8,000 sec.-ft., which is taken out through the drainage canal at Chicago, passes through the notch at Lake Erie and falls 362 ft., in that thirty miles, to Lake Ontario. There you have a reservoir of 87,000 sq. miles, without the necessity of dams or storage arrangements, with a normal mean flow of 205,000 sec.-ft. Think of it! Think what that means! Then further, there have been times in the last forty years when the minimum flow has been down to 171,000 sec.-ft., and yet, notwithstanding that variation from a mean of 205,000 to a minimum of 171,000 there is no problem of water shortage for the development at Niagara because the treaty between the United States and Canada limits the water to be taken for power purposes to 56,000 sec.-ft. There will never be a question at any time in all the years that treaty exists when there can be a shortage of water for the maximum possible development at Niagara.

Think of that immense reservoir of Niagara power, the 362-ft. drop, 164 ft. of which is direct at the falls. There is nothing complicated, nothing to cause any one of our engineers, anybody on this coast, to hesitate a single instant about tackling the development of that property. The men who built Baker River, or Oak Grove, or those great works in California, would smile at the ease of that development as compared to the kind of problems we have met out here, and yet, with this God-given power, with this wonderful possible development in the heart of the greatest industrial center of the world, power is not produced, nor

handed out to the consumers for any less, on an average cost, than it is by the progressive companies of the Pacific Coast.

Bear in mind that it will be charged that this wonderful thing in Ontario is a demonstration of the success of government ownership. Make them give due credit for what God has done there.

Relation of Generation to Total Cost

I was asked a peculiar question the other day, growing out of a statement I had made to the effect that if the cost of generating energy were nothing, there would be an infinitesimal reduction in the present cost of power to the average rural consumer. I had talked about Ontario and the cost of generating hydroelectric power and had shown there was every reason to believe the cost of generating power was much less at Ontario than at any development on the Pacific Coast. My friend asked afterwards, "Why did you devote so much time to showing the advantage of development at Ontario under which nature made it possible to generate power so cheaply as compared with developments out here, and at the same time stated that the cost of generation did not mean anything to our average rate?" Now that is a sample of the questions you will get. I am showing you now that if you raise any question in the minds of your auditors and leave it unanswered you will create a doubt as to the accuracy of all your statements.

Now the answer to this question is comparatively simple because you know that the cost of transmission and distribution is an important factor in the cost of power to a number of small customers, whereas it is comparatively unimportant in the case of a single customer using 5,000 to 10,000 hp. with a load factor of eighty or ninety per cent, being a load equivalent to 5,000 to 10,000 residential customers. Such a power customer will get a rate very close to the cost of generation because that and transmission are practically all the cost there is after transmission losses have been considered. This can be illustrated by showing the cost of the elaborate network of lines necessary to serve 10,000 homes as against the single line to the large power customer.

Political Aspects of Rates

Bear in mind also another point. It is the practice of most municipal plants, where they have the power to do it, to make rates attractive to the greatest number of people. By giving advantageous rates to the numerous small customers, popular favor is courted and secured, and the municipal scheme is entrenched. Private companies sometimes have met rates fixed by municipalities, not because they believed the rates were made scientifically, but because they thought it good business to do so. The municipal plant of Los Angeles charges a rate of 5.6 cents per kw-hr. for residence service applicable to the first 100 kw-hr. per month. Hence Los Angeles is called a 5.6-cent city, whereas Portland's top rate of 7 cents per kw-hr. for residence service classifies Portland as a 7-cent city.

The fact is, however, Portland's rate is cheaper,

In Portland, because we believe it is scientifically correct, we have established a step rate on the basis of the cost of service. The residence rate is the first thirteen kw-hr. for one dollar. The next seven are sold at seven cents, and the next fifty at three cents, and all in excess of that at two cents per kw-hr. Now take a use of 100 kw-hr. per month on the two rates and you will find that in Los Angeles it amounts to \$5.60 per month, while in Portland it is \$3.59.

This is one of the questions which will be propounded: Why is it Los Angeles has given so much lower rates than Portland if it is not because of municipal-plant operation?" The answer is that the rates are not lower, and furthermore that the Los Angeles Gas & Electric Corporation, now serving more than one-third of all the consumers in the city of Los Angeles, has exactly the same rate as the city plant. Municipal plants have not brought down rates in Los Angeles, nor in Seattle, nor anywhere else in Washington or California. They can't drive them down in Oregon. Sometimes you are forced, because of the unfair methods of the other fellow, to get away from the scientific method of rate-making, but the average price remains where it must be in order to meet the cost.

Believe in and Expound Your Cause

There are in every group of men certain of them who lead in the formation of opinions of the rest. That is human nature; there is nothing to do about that. There is a tendency, also well recognized, that the loyal employee, if he has confidence in his superior anywhere along the line, will have a far greater regard for the opinions of that superior than the opinions of an outsider. Now convince yourselves as to the facts involved in our cause, and, knowing that you are telling nothing but the truth, exercise the power given you by virtue of your position to create an opinion in your own immediate group in favor of the maintenance and continuance of public service as we understand it.

There are in every public service enterprise three cardinal elements: the public, which must be served fairly, equitably, honestly and efficiently; the men who make the wheels go 'round, the employees, that great staff composing the rank and file of the organization, who must be treated fairly and the revenues of the utility must be such as to pay fair compensation in proportion to the effort expended by the men who make it go; lastly, and by no means least, the third element is represented by the man whose money is in it. There must be fair play and adequate reward for that man. Without money we cannot grow or make extensions. More money must be kept pouring into these enterprises continuously, and that process can't go on unless the money that is invested today, and about to be invested, is sure of fair treatment. Failure to observe the rights of any of these three elements means failure of the business.

We ought to believe in our own cause, and we ought to preach its gospel if we believe in it. We ought at every opportunity to seek to impress those with whom we come in contact that there

is merit in the cause we represent, the cause of the existing order of things capable of continuing under the present policy of rewarding initiative rather than have to go to paternalism and socialism—to that even plane of all things on which the man of ambition and energy, who has a desire to grow in this world, stagnates and becomes ineffectual.

Public Relations Advisory Council Formed by Denver Utility

AN innovation in the way of inter-company organizations which bids fair to revolutionize all previously adopted methods of handling public relations has been inaugurated in the Denver office of the Public Service Company of Colorado with the formation of the Public Relations Advisory Council.

The purpose of the council is fundamentally to devise ways and means of better serving the public, to promote better public relations and to build good will.

This body, which is comprised of a group of sub-executives of the Denver office, is the result of the creative effort of Rufus G. Gentry, director of public relations for the Colorado company.

Sub-executives were chosen for the council in place of their superiors for the reason that it is these men who come most intimately in contact not only with the public, but also with the larger mass of employees through whom the most effective public relations must be attained.

The council, it is believed by executives and officials, is the first concrete expression evolved with a public utility personnel for the purpose of reducing to a tangible form the improvement of modes of service which would tend to promote better public relations.

Proof of their sincerity was evidenced by members of the council who made a few suggestions as to means which might be employed by their specific departments in advancing, in a manner that would be noticed by the public, the policies of courtesy, accuracy and efficiency which are constantly developing new possibilities for increased service to the public.

Members who make up this unique and highly important new body include Mr. Gentry, chairman; Frank R. Jamison, director of publicity; Robert Kelly, Investigation and Trouble departments; Charles H. Elliott, Contract department; Jack T. West, superintendent of the Sales Floor; Charles Sharland, Meter Reading department; O. L. Mackell, chief clerk; Gaylord B. Buck, superintendent electric sales division; Roy G. Munroe, superintendent gas sales division; A. A. Klinge, Fitting Shop and Gas Meter department; Earl Johnson, Credit department; E. Roy Johnson, appliance windows; E. P. Hodges, Electric Meter shop; John A. Miller, superintendent electric domestic sales; and William B. Walters, assistant manager of the Securities department.

Condensing Equipment

A Serial Report of the Prime Movers Committee, P. C. E. A.*

EFFORTS of this committee have been confined to trying to find causes and remedies for tube failures in condensers such as are used for condensing steam from prime movers in power plants. Tube failures are one of the principal sources of trouble in plants using sea water for condensing steam. The committee did not expect to find a sure cure for all the tube troubles but has tried to get information to prove whether or not different remedies as suggested by prominent engineers and scientists will give the relief which the authors claim.

The principal work of the committee was done by W. E. Thompson of the Southern California Edison Company.

It has been the general opinion for some time that air and sand in the cooling water are the principal causes of trouble at the Long Beach plants. Attempting to discover the possible truth of this, the following experiments and many others were made.

Effect of Sand in Water

Sand and fresh water were pumped through a new condenser tube for 150 hr. and the tube then was split for inspection. There was no evidence of pitting or grooving; the tube was polished like a mirror and evenly worn 1/64 in. No air was pumped through tube as system was closed. A velocity of the water through the tube of about 15 ft. per sec. was maintained in order to aggravate the trouble and accelerate the experiment. The temperature of the water was approximately 175 deg. F. The proportion of sand to water was all the sand that could be carried in suspension. The same experiment was tried with water at a velocity of 6 ft. per sec.; in this case tube was bright and clean but no wear could be detected.

Effect of Air in Water

Aerated fresh water was pumped through a new tube for about 150 hr. at a velocity of about 15 ft. per sec. The exact proportion of air to water was not known but admission was from 1/4-in. needle valve 1/4-turn open and under 100-lb. pressure. The temperature of the water was approximately 150 deg. F. The tube was coated over the entire inner surface with a hard, thin, black scale. Under this scale the tube was pitted from one end to the other, visible to the naked eye as very small specks.

The same experiment was tried with water at a velocity of 6 ft. per sec. The "specks" were found only in patches and were not seen so easily with the naked eye but were of the same appearance under the microscope as in the first experiment.

Clean sea water containing only that amount of air which is normally held in solution was pumped through a new tube at a velocity of 5 ft. per sec. for one week. Pitting was observed on the bottom near the outlet of the tube and the inlet end was covered with a red-brown slimy scale under which no pitting was detected. The scale was largely iron rust from the pump. The potential between tube and water was 0.10 millivolt; tube positive to water.

A 6-in. length of a new tube was split longitudinally and troughs made by closing the ends. One section was filled with sand which was kept moistened with sea water for 30 days and the other was filled with clean sea water. The trough which contained the moist sand was covered completely with small pits resembling those found in the air test; there was no evidence of corrosion in the trough containing clean sea water.

Clean sea water with normal content of air was pumped through a new condenser tube and a current of about 1/2 amp., d. c. was passed from the tube to the water. After one week this tube was pitted in

about the same manner as the tube through which air and fresh water had been pumped.

These experiments indicate that air and sand or other solid particles in sea water are important factors in condenser-tube corrosion. Elimination of sand from condensing water is extremely difficult in existing plants and is a factor which should be given serious consideration in locating new plants and in designing intake structures.

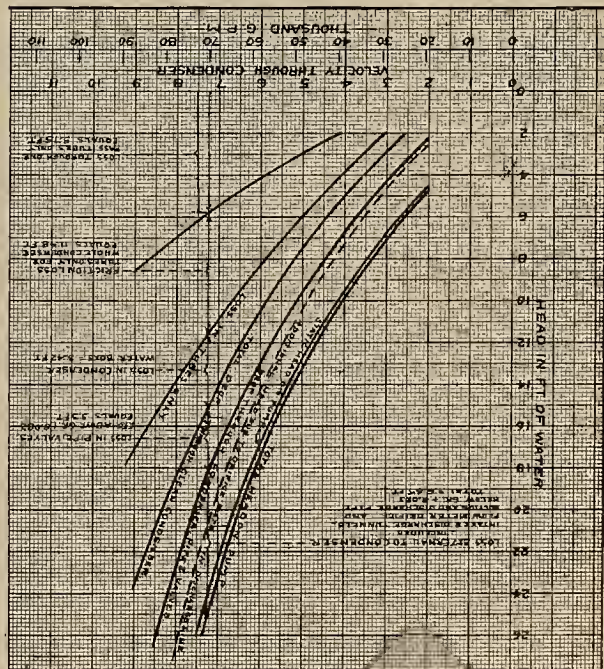
Elimination of Air from Condensing Water

The removal of a portion of the entrained air in condensing water is not considered a serious problem. It is probably that portion which is readily removable which is the most active and does the most damage to the condenser tubes. In order to determine if air can be removed from circulating water in actual practice a circulating pump was equipped with two standpipes, one on the suction and one on the discharge side. These standpipes each were supplied with a valve at the top and at the bottom. The bottom valves were closed and the pipes filled with water, the top valves then were closed and the bottom valves opened. In the standpipe on the suction side, the water dropped until pressures were equalized and immediately a stream of air bubbles started up the standpipe and continued until all the water had been replaced with air. An exhaust pump working on this standpipe would have made the action continuous. In the standpipe on the discharge side a steady stream of very fine bubbles of air rose to the top and every few seconds quite a few large bubbles would rise. This pump obtained its water from the normal supply system and this water was of such quality as is used under normal operating conditions.

It is believed that apparatus can be developed for removing a large portion of the entrained air from condensing water at a cost which will be justified by the increased life of the condenser tubes.

Electrolytic Protection of Condenser Tubes

The 55,000-sq. ft. condensers of units No. 7 and No. 8 of the Long Beach plant have an electrolytic system of protection, using a low-voltage d. c. generator. The positive lead of the generator is connected to cast-iron lugs in the water boxes and the negative lead to the tube sheets. The value of this protection has not yet been demonstrated fully.



Copper anodes are being used to determine whether or not current is carried through the water in the tube to the tube by possible deposits of copper on the tubes. Preliminary examination indicates that copper is being deposited on the tubes.

At the Redondo plant a similar system appeared to give considerable protection, but this plant was troubled mainly with stray railway currents. At this plant the tube sheets were insulated from the condenser shell and from the water boxes by a heavy coat of armature varnish and all dowel pins between the tube sheet, shell and box were removed.

It is believed that corrosion caused by clean sea water which is free from air can be overcome by electrolytic protection. However, positive proof of this is lacking.

Artificially Scaled Tubes

Four condenser tubes were scaled artificially by circulating sea water at 125 deg. F. through them at a velocity of about ½ ft. per sec. and at the same time passing 1½ amp., d.c., per sq. ft. of tube from a zinc anode in the tank containing the water to the tubes. The tubes were coated for four days and then allowed to dry for 10 days before using. One tube coated in this manner was tested for 90 days in an experimental condenser and showed no evidence of corrosion. The other three tubes were installed in a condenser in actual service and preliminary examination showed no corrosion while other tubes in the same condenser showed considerable corrosion.

Effect of Oxide Coating on Condenser Tubes

Couples of cast iron and condenser tube material were made up and suspended in sea water at the inlet tunnels at Long Beach. The iron seems to afford to the tube some protection from corrosion as long as the iron is kept clean and free from rust. As soon as rust appears a slow action appears to take place on the tube, being apparently general over all the surface.

Cast iron and zinc "stars" were screwed into tube sheets and seemed to give a slight measure of protection. The zinc must be kept clean of corrosion scale or it will become cathodic to the tubes and tube sheets and thus increase corrosion. Cast iron does not seem to do this, although as it becomes covered with rust the potential between iron and brass becomes less.

The iron-oxide protection-coating theory is borne out by experience at the Santa Barbara plant, also of the Southern California Edison Company. At this plant tube failures are practically unknown. Some of the condensers had been in service 25 years when the plant was abandoned, and the tubes were practically as good as new or at least would have had another 25 years of life. Some tube trouble was experienced in this plant, but this was with tubes which had been previously used in other plants. Even these second-hand tubes gave longer life than new tubes in most other plants on the Pacific Coast.

The circulating water for this plant was taken at a point about 500 ft. from the shore and through a floating suction pipe so as to take water about 5 ft. below the surface and as far from the bottom as possible to avoid sand. Comparatively clean water was obtained. The water was pumped through about 1,200 ft. of cast-iron pipe. The quantity of water was small, due to large friction loss, and the temperature in the condensers was high as the vacuum on those types of units was usually about 25 in. to 27 in.

As a result of these conditions a scale was deposited in the tubes that was not of sufficient thickness to be objectionable, but formed a good protective coating about .003 in. thick. An analysis of this scale is given in the following table:

Material	Percentage
Silica	40
Calcium and Magnesium Compounds.....	10
Iron Oxide	36
Zinc	3
Iron	Trace
Tin	Trace

The tube from which this scale was taken had been tinned when first installed. The tin shown in the above analysis probably came from the surface of the tube.

A small condenser from the Santa Barbara plant, after doing 13 years of service, was moved to the laboratory at the Long Beach plant for experimental purposes. Tubes from this condenser were covered with a layer of scale about .003 in. thick. Water taken from the Long Beach plant intake was pumped through this condenser for 60 days, after which tubes from various sections of the condenser were removed for careful inspection. No new corrosion was in evidence but about 5 per cent of the tubes showed heavy corrosion for a distance of about ¼ in. from the ends. This probably can be explained by the fact that this condenser had been used in another plant before it was used at the Santa Barbara plant. Due to corrosion which was started at the first location of this condenser, it was necessary to retube this condenser in 1911 and it is probable that some of the best old tubes were re-installed at that time. This also explains the condition of the tube sheet which showed heavy corrosion which had been effectively checked long ago. All other tubes in this condenser showed absolutely no corrosion.

Steel Condenser Tubes

Sea water at a velocity of 5 ft. per sec. was pumped through a soft steel tube of 1 in. diameter and 22-gage thickness. Corrosion was rapid at first but as rust accumulated the rate of corrosion decreased. After 560 hr. the thickness of walls had decreased about 10 per cent. A similar tube was tested with sea water at 125 deg. F. and a velocity of 2 ft. per sec. and at the same time passing a direct current of 1½ amp. per sq. ft. between a cast-iron plate suspended in the water and the tubes, the iron plate being the positive terminal. A brown scale was formed on the tube and after a 3-days run the tube was removed and dried for 10 days, after which it was put on test again under conditions as mentioned for the first steel tube tested. Corrosion was very slow and after a test of 15 days was hardly noticeable.

Porcelain-Enameled Steel Tubes

Some 1-in. diameter, 22-gage steel tubes were porcelain-enameled and put through various tests. The heat transference of these tubes was about 80 per cent of that of a 16-gage brass tube. The enameled surface resisted sand erosion but developed minute cracks through which the salt water started corrosion of the steel tube. It is believed that there are great possibilities for such a tube provided an enamel can be developed which has a thin coat and which resists cracking, or an enamel can be produced which can be applied to metal of greater corrosion resistance than steel.

Other Coatings for Condenser Tubes

Several different kinds of paints, oils and greases were applied to tubes and their effect as a protective coating noted. All oils and greases failed, due to washing off. Some internal boiler paint gave good results and after a test of 90 days showed continued good protection. One paint made especially for this purpose seemed to increase corrosion and even to initiate it.

Muntz Metal Tubes

In the new Long Beach plant, by some accident, several Muntz Metal tubes were included in a shipment and were installed. In about six months they began to develop leaks. Tests showed them to be strongly anodic to the other or admiralty tubes.

Entrance nozzles were installed on two 55,000-sq.-ft. condensers in the Long Beach plant. These nozzles caused an eddy at the end of the nozzle which caused serious erosion and corrosion at this point and extending about 3 in. into the tube. The nozzles were removed but the action once having been started seemed to continue. In order to try to check this action all of the ends of the tubes for a distance of about 2 ft. have been painted with two coats of internal boiler paint. This paint is failing due to excessive erosion caused by rough tube surface. The manufacturers of the nozzles above mentioned are supplying some 5-in. nozzles which are long enough to bridge the affected portion of the tube. A few of these new nozzles will be tried out and results noted before deciding on a complete installation.

In the new 70,000-sq.-ft. condenser which is being installed with the 50,000-kw. turbine at Long Beach

the tubes will be allowed to extend into the water box 4 in. beyond the tube sheet, at the entrance end. The tubes will be expanded into the tube sheet at the entrance end, and the protruding end will be expanded into a bell shape to encourage a smooth and uniform flow of water in the tube at the entrance end. It is believed that this will decrease the friction loss in the tube and also eliminate erosion at the entrance end of the tube, a serious source of trouble in a large number of condensers.

Conclusions

Results of experiments and operating data collected lead to the following conclusions:

- 1. Good quality tubes should be procured.
- 2. Circulating water should be clean and free from solid particles and air.
- 3. Certain scales form effective protection to condenser tubes and greatly prolong their life. Such scales are sometimes formed in practice, but may be artificially produced.

TABLE I.—Table of condenser data from Long Beach plant.

CONDENSER UNITS						
Item.....	1	2	3	4	5 & 6	7 & 8
Manufacturer.....	Wheeler	Wheeler	Alberger	Wheeler	Wheeler	Westing-house
Date installed.....	{Sept. 1911	{Feb. 1913	{May 1914	{July 1924	{July 1924	{Jan. 1925
Total number of tubes...	4,831	6,069	7,535	5,012	2,696	10,504
Number in:						
W. auxiliary.....	1,150	1,184	2,247	..	..	..
E. auxiliary.....	0	0	2,247	..	..	..
W. main.....	1,840	2,442	1,798	..	..	..
E. main.....	1,741	2,443	1,798	..	..	..
Gage of tubes.....	16	16	16	18	18	16
Length of tubes						
F. to F. tube sh.....	17' 2"	17' 2"	17' 2"	17' 9"	17' 3"	20' 3"
Outside area of 1 tube,						
sq. ft.....	4.25	4.25	4.25	4.5815	4.25	5.236
Thickness of tube sheet.....	1 in.	1 in.	1 in.	1 1/4 in.	1 1/4 in.	1 1/2 in.
Total area sq. ft.:						
Rated.....	21,497	27,000	32,000	23,000	12,000	55,000
Actual.....	20,532	25,793	32,023	22,963	11,458	54,999
Sq. ft. per kw. actual....	1.711	1.719	1.6011	2.296	1.909	1.571
Number of passes.....	2	2	2	3	2	2
Inside area of tubes per						
pass, sq. ft.:						
1st pass.....	9.1432	10.6273	19.8500	7.2940	5.9541	21.48257
2nd pass.....	12.1953	16.1795	15.8835	7.7783	5.9541	21.48267
3rd pass.....	..	..	..	7.0672	..	..
No. of tubes per pass.:						
1st pass.....	2,070	2,406	4,494	1,651	1,348	5,252
2nd pass.....	2,761	3,663	3,596	1,761	1,348	5,252
3rd pass.....	..	..	..	1,600	..	..
Circulating water,						
G. P. M.....	24,000	30,000	40,000	18,000	16,500	70,000
At R. P. M.....	240	350	265	..	445	290
Sec. ft.....	53,472	66,840	89.12	40.104	36.762	115.95
Velocity through tubes,						
ft. per sec.:						
1st pass.....	5.848	6.2849	4.4896	5.489	6.1742	7.259
2nd pass.....	4.3846	4.1311	5.6108	5.155	6.1742	7.259
3rd pass.....	..	..	..	5.674	..	..

Sea water is used at this plant for injection water, the extreme temperature variations being from 55 deg. F. to 75 deg. F. The average tube life on units Nos. 1, 2 and 3, which are the only ones in service long enough to obtain reliable data, is 4 1/2 years. The condensers of these units were retubed during 1925 so this gives a good period over which to obtain tube life.

Operating Data 55,000-sq.-ft. Condenser

Fig. 1 shows graphically the results of tests of friction loss and other losses in various parts of the path of the circulating water through a 55,000-sq.-ft. condenser at Long Beach. Under normal operation these condenser tubes become coated with a thin layer of slimy marine growth which increases the friction loss in the tubes about 0.7 ft. and reduces the heat transference in the ratio of 350 to 300. This coating of slime will not wash off but can be blown out with air at about 100-lb. pressure. It is necessary to blow the tubes about every 3 or 4 months.

The tubes of this condenser are packed at each end as follows: Beginning at the water-box end of the packing, a 1/16-in. fiber ring, 3/16-in. fabric packing impregnated with beeswax and tallow, 1/4-in. metallic packing, 1/8-in. fiber ring. This packing is proving fairly satisfactory except that the fabric packing is disintegrating and will be omitted in the new condenser soon to be installed. The new packing job will consist of a 1/4-in. fiber ring and a 3/8-in. metallic ring.

An interesting case of trouble was encountered in

the air ejector of this condenser which is of the "ra-dojet" type. A gasket between the salt-water compartment and the condensate compartment of the intercooler sprung a leak allowing condensate to leak into the cooling water. This leak gradually increased over a period of 3 months when it had reached a maximum of 400,000 lb. per day, causing the make-up water to be four times as high as it should be. The unit was shut down, the trouble located and remedied.

The Pacific Gas and Electric Company reports conditions and experiences with 4 condensers in plants in San Francisco. Engineers of that company are convinced that the life of tubes is considerably longer with low-velocity cooling water and elimination of air in the water. With high-velocity water most of the tube failures are near the entrance end while with low velocity the whole tube gradually becomes brittle and weak. The life of tubes in one condenser was prolonged about a year by the use of entrance nozzles.

The San Diego Consolidated Gas & Electric Company reports an interesting experience with the condenser of a 15,000-kw. turbine. This turbine was placed in operation Feb. 14, 1923, and 38 days later 3 tubes with holes pitted in them were removed. By the end of the year, 110 tubes had become pitted and after 54 weeks of service 488 tubes had become pitted. Due to the rapid increase of failures the unit was taken out of service and a new set of tubes installed.

The unit was placed in service again April 14, 1924, with a new set of admiralty tubes and 55 days later another pitted tube was removed. During the next 5 months the tube failures averaged one tube per day and during the subsequent 4 months the failures averaged 2.2 per day. From March, 1925, to the present time the tube failures have averaged .57 of one tube per day.

Records of location and date of tube failures have been kept and it is an interesting fact that during the period from Aug. 15, 1924, to the end of the year there were 15 failures in the first pass and 132 in the second pass, but from Aug. 1, 1925, to the present time conditions have been reversed and there have been 82 failures in the first pass and 10 in the second pass.

Brass caps are screwed over the ends of the leaky tubes in place of the ferrules and then large numbers of the accumulated failures are renewed at a convenient time. During September, 1925, 190 tubes in the first pass and 281 in the second pass were renewed. The tubes removed were examined to find the location of the failures, most of which were near the entrance end of the tube. Curves have been plotted showing the number of tubes which were pitted at different distances from the water entrance ends for each pass. These curves are shown in Fig. 2. It is not known why so many of the tubes are pitted near the entrance end. The water does not contain very much sand and the circulating-pump suction is tight and free from air leakage.

The condenser is provided with equipment for cleaning the tubes with a jet of water at 200-lb. pressure while in operation. This cleaner was used every day for about a year. Then it was thought that possibly the jet might have the effect of eroding the tubes too much or of washing off a coating of protective scale and the number of cleanings was reduced to 2 per week. The velocity of the circulating water through the tubes is about 5.5 ft. per second.

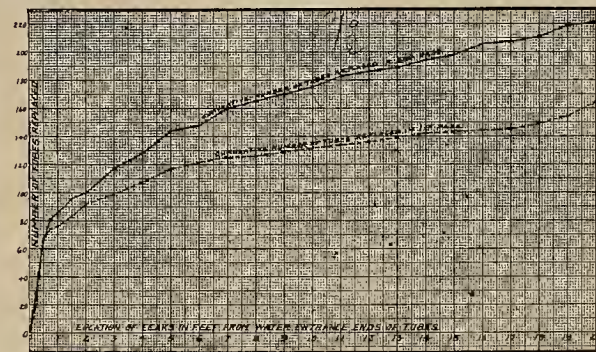


Fig. 2.—Curves showing location of leaks in tubes removed from condenser of 15,000-kw. turbine at San Diego.

CENTRAL STATION CONSTRUCTION OPERATION AND MAINTENANCE

Ground Detectors Warn of Dangerous Conditions Design Features and Operating Characteristics of Various Types of Instruments Outlined and Compared

By L. F. Hunt, Development Engineer, Southern California Edison Company, Los Angeles.

In most of the distribution substations of the Southern California Edison Company the low-tension sides of the transformer banks are delta-connected and therefore have no ground connections. With this arrangement a ground occurring on a circuit does not develop sufficient short-circuit current to kick out the circuit breaker on that particular circuit. However, a grounded feeder presents an extremely hazardous condition, and it becomes necessary to use a ground detector to give the operator an indication of the condition of his circuits. The state law also makes it necessary to have some device to give an indication when a line becomes grounded.

Satisfactory operation of a ground detector presupposes its ability to indicate even the slightest ground and also to withstand a full ground. The most serious case of a ground is where a line has dropped on dry earth or pavement. Such grounds are of very high resistance and thus cause but little voltage change on the line affected, as far as substation indications are concerned. Early ground detectors to be found on the market would not satisfy the requirements. Therefore power-company investigations were directed toward the development of a detector that would meet the desired conditions.

Armstrong Type

Electrical connections of this type of detector are shown in Fig. 2. It may be noted that three potential transformers are used, star on the high side and delta on the low side with the lamps worked in as shown. When a bell is used it may be controlled by a telegraph-relay connected across the open delta as indicated in Fig. 2, or it may be of the resonant



Fig. 1.—Partially cut-away view of Armstrong type of ground detector.

type that will ring with very little energy at 50 cycles.

When a ground occurs on any leg of any of the lines fed from the bus to which is connected the ground detector the voltage across the primary of the potential transformer is reduced in proportion to the conductance of the ground; that is, if a full ground occurs the voltage across the primary will be zero. In this case the secondary voltage of that transformer also would be zero and the lamp across that secondary would be completely dark. Thus in the case of any ground the lamps so indicate by an unbalance in brightness. Phase letters are marked on the frosted glass front and a chart showing typical lamp brilliancies for certain ground conditions is provided for the guidance of the operator wherever this instrument is used. In cases of heavy grounds the voltage difference across the bell is sufficient to cause it to ring.

The advantages of this type of detector over the earlier types are that it gives more definite results from grounds and that it distinguishes the particular phase in trouble. The disadvantages are: since the development of this type carbon lamps have been discontinued and are hard to get; on slight grounds it is difficult to distinguish the differences of lamp brilliancy; in daylight where the light is very strong it often is difficult to distinguish the differences.

Under normal conditions the vectors of primary voltage are as shown in Fig. 2 (left) as A, B, and C; secondary vectors are shown as W, X, Y, and Z. This shows that the voltages across each of the lamps are equal; there is no voltage across the bell. With a full ground the vectors are as shown in Fig. 2 (center); vectors YX and XW have increased, ZY reduced to zero and WZ markedly increased, giving a voltage across the bell. A ground of about 50 per cent intensity produces a condition indicated by the vectors in Fig. 2 (right). Others follow the same general law.

Voltmeter Type

The so-called voltmeter type of ground detector consists of an ordinary-appearing horizontal edgewise voltmeter and a bell mounted on a panel. The voltmeter is fitted with mercury contacts that close when the voltage drops to 30 or increases to 90. When these contacts are closed, a circuit is completed through a source of potential and a small relay, causing

the bell to ring. The appearance of the instrument is as shown in Fig. 3.

Electrical connections are as shown in Fig. 4, the voltmeter connected across the secondary of a single potential transformer. Through the disconnecting switch the primary of the potential transformer may be connected between ground and either of two phases of the bus.

Normal voltage to ground is 57.7 per cent of line voltage, so under normal conditions the voltmeter reads approximately 63.5 volts when the potential transformer has a normal secondary voltage of 110. In case the leg of the bus to which the detector happens to be connected becomes fully grounded the voltage across the instrument drops to zero. However, if the ground occurs on one of the other two legs the voltmeter will register approximately 110 volts. To determine which of the two legs the ground last mentioned may be on, the disconnecting switch is swung over to the opposite leg; if the voltage remains the same the ground is on the leg of the bus to which there is no connection and if the voltage drops, the ground is on the leg to which connection was just made. The greater the intensity of the ground, the greater is the divergence in the meter reading from the normal of 63.5 volts.

The advantage of this type of ground detector is that it requires but one potential transformer. Its disadvantages are that the mercury contacts require constant attention; there is no reading for very slight grounds; a ground of nearly 50 per cent intensity is required to ring the alarm bell.

Vectorial voltage relations are shown in Fig. 4 where normal con-



Fig. 3.—Voltmeter-type ground detector.

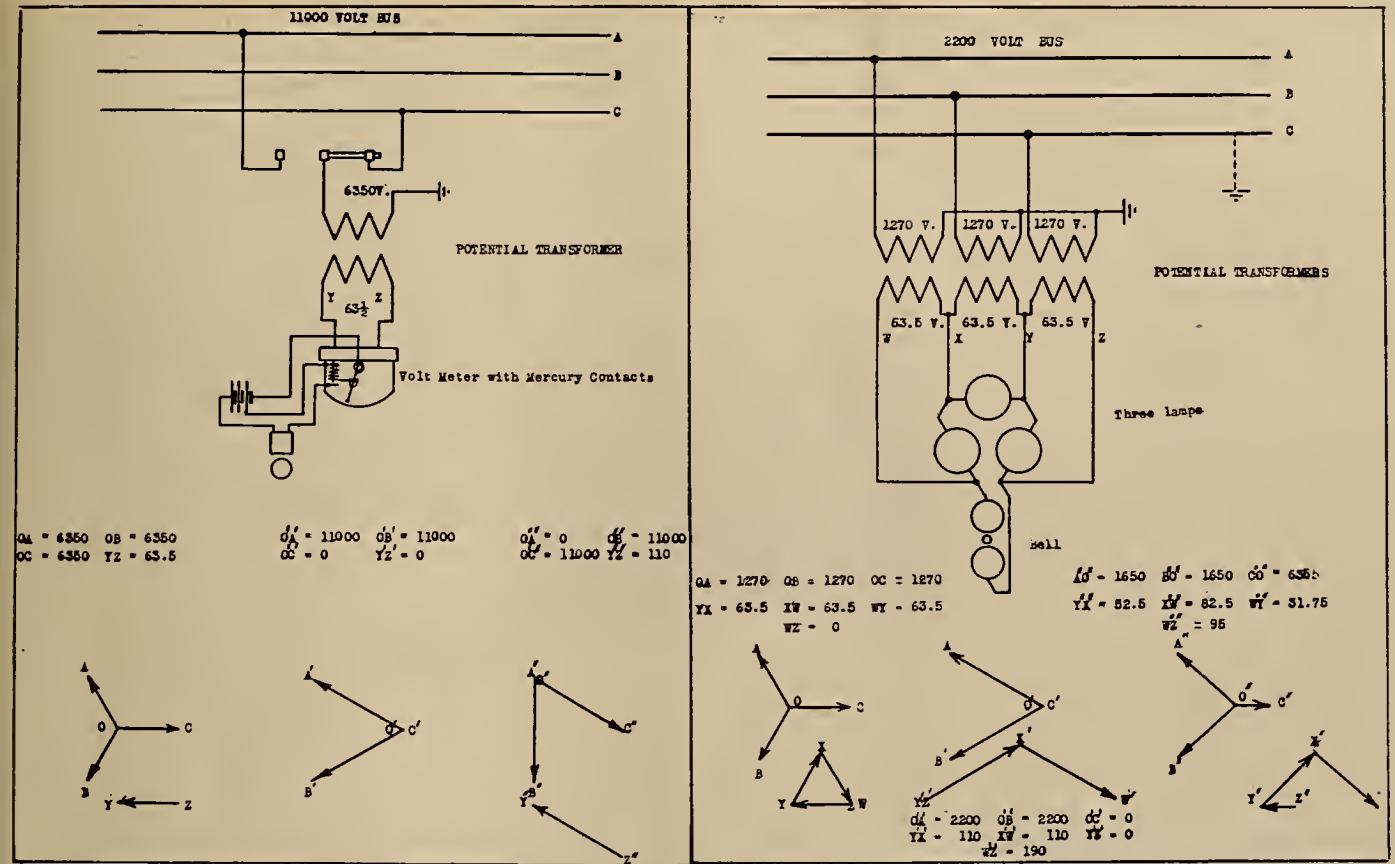


Fig. 4.—Wiring and vectorial diagrams for voltmeter-type ground detector. Fig. 2.—Wiring and vectorial diagrams for Armstrong ground detector.

ditions are indicated at the left, a full ground on phase C (center) and a full ground on phase A (right).

Hot-Wire Type

A hot-wire-type ground detector has the appearance of a large glass-front meter with a circular target in the center. This circular target is the indicating arm of the instrument. The target is balanced on a pivot by means of three members, each of which is attached to a current-carrying wire. These wires are stretched between terminal blocks and each is so arranged that the target maintains a central position under balanced line conditions. A change in the tension of any of the wires causes a corresponding change in the position of the

target with respect to the index painted on the glass front of the instrument. Fig. 5 shows the hot-wire type ground detector as installed.

Electrical connections are shown in Fig. 6. It may be noted that each of the "hot wires" is energized from the secondary of a bell-ringing transformer which it short circuits. The three potential transformers are connected star on the high side and delta on the low side. The bell-ringing transformer primaries are connected one each to each of the secondaries of the potential transformers as indicated. The signal bell as usual occupies a position across the open delta of the potential transformers.

Normally each wire carries the short-circuit current of one of the bell-ringing transformers. Thus each wire has a certain heat dissipation to take care of and accordingly expands a certain amount (lengthwise). Normal voltage across the primary of each bell transformer is 63.5. When a ground occurs the voltage to ground of the leg involved is reduced and corresponding voltages of the other legs (to ground) is increased. This increased voltage and consequently increased current in two of the "hot wires" cause them to expand an abnormal amount. At the same time the reduced voltage and consequently reduced current in the third "hot wire" causes it to contract. The net result of this action is to throw the target indicator off-center in the direction of the grounded leg and a distance proportionate to the intensity of the ground. For purposes of testing the three "hot wires" push-buttons are installed in the primary circuits of the bell-ringing transformers. Depression of a push-button causes the stoppage

of the current flow in the corresponding "hot wire," causing it to contract and throw the target to that side, if the instrument is in working order.

Advantages of this type of instrument are that it gives the phase of leg in trouble and gives a definite deflection. The disadvantages are that the bell-ringing transformers are not consistent, causing vibration in some cases; and that trouble has developed in keeping the targets on center.

Vectorial relations for the hot-wire detector are as shown in Fig. 2. Normal relations are as shown at the left. A full ground on leg C produces relations shown at the center. Other conditions are similar.

Editor's Note: The concluding half of Mr. Hunt's article on Ground Detectors will appear in an early issue of the Journal of Electricity.

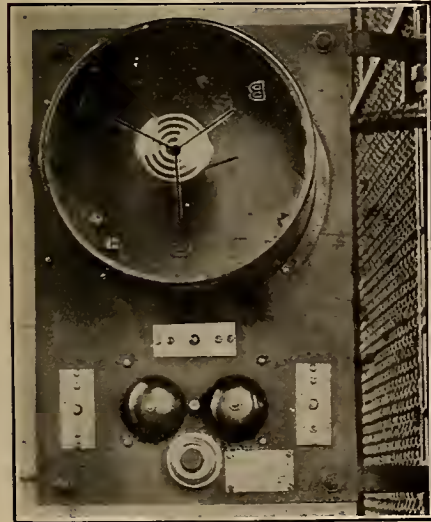


Fig. 5.—Hot-wire-type ground detector.

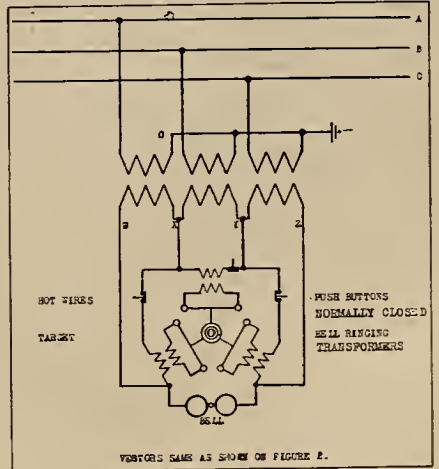


Fig. 6.—Wiring diagram for hot-wire-type ground detector.

Lake Cushman-Tacoma Line Involves Long Span

Design and Structural Features of the World's Longest Transmission Span Are Discussed Briefly

By A. F. DARLAND, Superintendent of Electrical Construction,
Cushman Power Project, Tacoma, Wash.

The most interesting feature of the new double-circuit 110-kv. Lake Cushman transmission line is the span across The Narrows of Puget Sound. This is believed to be the longest aerial span in the world for the transmission of electrical energy. The Narrows is a navigable channel 4,800 ft. wide from shore to shore and flanked by bluffs about 275 ft. high on the west and 330 ft. high on the east side. The best tower sites on the tops of these bluffs are some distance back from the water's edge, necessitating a total span of 6,241 ft. 6 in.

To secure a minimum clearance of 200 ft. over the water as required by the war department, and this under extreme weather conditions when the ice-laden cables might have a maximum total sag of 397 ft., the main supporting towers were designed to have a total height of 316 ft. 6 in. from the concrete bases to the top of the superstructure. The towers are of the simple prop type and are rectangular in form, being 54 ft. square at the base and tapering to the top. At a height of 313 ft. a 69 x 12-ft. deck is provided as a working area and for inspection purposes. The balance of the total height is taken up by 6-ft. sheaves, whose bearings are mounted level with the deck. The deck is reached by a light stairway with double railings and with landings at convenient intervals. In design the use of the least possible number of members and the greatest possible ease of erection were considered, together with economy of material. The familiar built-up type of column, consisting of an I-beam and two channels was selected. The minimum thickness of metal used is 5/16 in. with possibly a few minor exceptions. The maximum computed reaction at the base of the columns is 310,000 lb. and the greatest uplift 89,000 lb. while

the greatest stress in any of the diagonals is 33,500 lb. The total weight of each tower is 260,000 lb. All four towers are identical, irrespective of the 53-ft. difference in elevation between the east and the west pairs.

Each circuit crosses on its own pair of towers, which are spaced to produce a minimum horizontal clearance between circuits of 120 ft. The conductors in each circuit are arranged in a horizontal plane with 30-ft. clearance between phases. The conductors are 1½-in., 35-strand, self-supporting concentric-reverse-lay, plough-steel-wire cables, having an ultimate strength of 180,000 lb. after galvanizing and stranding. The net area is 0.93 sq. in. and the weight about 3¼ lb. per linear ft. This cable affords a safety factor of three under maximum loading of ice and wind which was taken at 60,000 lb. produced by a wind load of 8 lb. per sq. ft. on the projected diameter of the cable when encased in ½ in. of ice at a temperature of 0 deg. F.

Each conductor proper terminates in an open socket and clevis attached to a nest of twelve parallel strings of Locke high-strength suspension insulators of eleven units each. One 90-ft. and one 70-ft. relieving cable extends out from the insulator yoke and along the main cable. These relieving cables are attached to the main cable by a series of steel U-bolts evenly spaced; the U-bolts were applied successively beginning at the outer ends of the relieving cables. While these clamps were being applied, the relieving cables were stressed in successive increments in order to put equal stress on all clamps. The purpose of these relieving cables is to reduce terminal stress in the main cable and to clamp out cable vibrations. Mechanical loading

of individual strings is equalized by means of calibrated springs. The insulator strings are held between two rigid steel frames or yokes conical in general shape. Two supporting cables attach to the shore-side yoke of this insulator assembly and pass over the 6-ft. sheave and thence down and back approximately 900 ft. from the tower to concrete anchors imbedded 24 ft. in the earth. The structural steel members to which the anchor cables are attached are carried through the concrete to the extreme back end of the anchor. The two anchor cables give double strength where they pass over the sheave and facilitate replacements or take up. Either anchor cable may be slackened or removed without disturbing the other.

Jumpers conductors of 300,000-circ.-mil. stranded copper cable attach to the steel conductors on the water side of the insulator assembly and are carried through and around the main towers back to switching towers situated near the cable anchors. The transmission lines approaching The Narrows from either direction are dead-ended on these switching towers. The disconnecting switches are provided to isolate either crossing circuit and to parallel the transmission lines through one crossing circuit. If or when necessary, any three of the six conductors of the crossing spans may be selected to serve as the three phases of a single crossing circuit.

Tower foundations and cable anchors were constructed at a cost of \$33,000. The contract for the fabrication and erection of the main towers, together

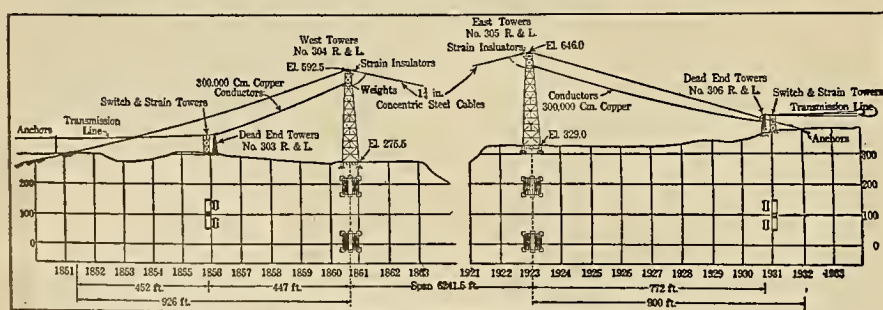


Fig. 1. Elevation and plan of the crossing.

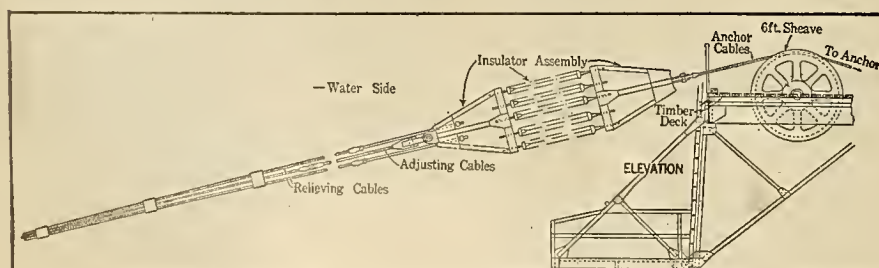


Fig. 2. Showing typical construction at the tower tops.

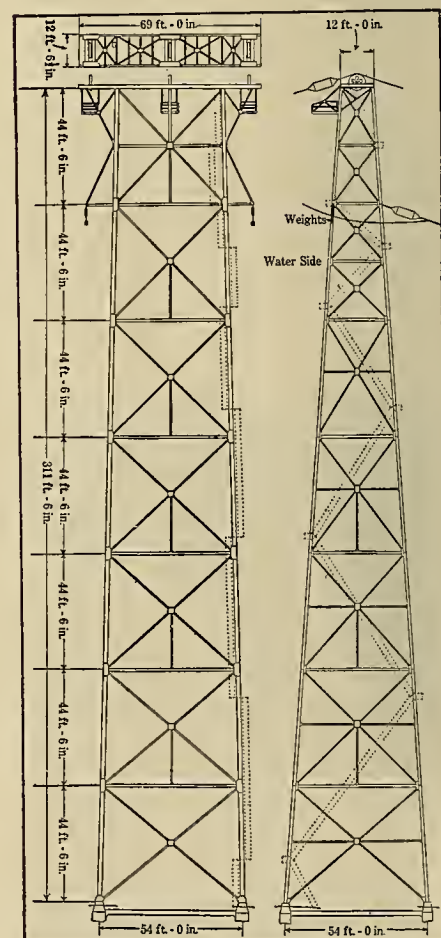


Fig. 3. Showing general design features of the crossing towers.

with the switching tower and for stringing the cable, was awarded to the Star Iron & Steel Company, Tacoma, for \$149,000. John A. Roebeling's Sons Company furnished the cables, fittings and insulator assemblies for \$37,600, making the complete cost of the crossing \$219,600. Stringing of the cables was commenced early in November, 1925, by J. B. Murphy, a sub-contractor under the Star Iron & Steel Company's contract.

The structural design of this crossing span is attributable to J. V. Gongwer, superintendent of mechanical construction on the Cushman project, who acted as resident engineer during construction. The project is being carried on under the general supervision of J. L. Stannard, chief engineer.

Electric Welder Permits Field Repair of Large Valve

By H. Shields, General Superintendent, Nevada Valleys Power Company, Lovelocks, Nevada.

Electrical welding was used to advantage to repair a damaged 4-ft. cast-iron gate valve at the Lahontan plant of the Nevada Valleys Power Company, near Hazen, Nev.

After a protracted cold spell during which the temperature was nearly always below zero, at one time down to 17 deg. below zero, this valve cracked around the top of the bonnet for a distance of nearly 5 ft. The valve had been partly uncovered during some construction work. The whole valve and the adjacent excavation soon was a solid mass of ice.

An examination of the damage and advice of different welders caused the selection of electrical welding equipment. The necessary pre-heating and annealing attendant upon the use of other methods of welding meant the removal of the valve and its shipment to some shop having equipment large enough to handle the job. Further, this latter method would have meant lost time and greater expense in general.

Accordingly the electrical welding machine was shipped from San Francisco by the Welding Service & Supply Company. The actual welding was done by A. L. Requa of that firm. Actual time consumed on the job was only about 48 hr. The method used is shown plainly in the accompanying illustrations. After cleaning and chipping the crack, another groove about

$\frac{1}{2}$ in. wide and $\frac{1}{4}$ in. deep was made all around the crack and about 2 in. from it. Several steel straps, $\frac{3}{8}$ x $2\frac{1}{2}$ -in., then were fitted across the break and around the corner of the bonnet. These steel straps were placed about 10 in. apart and stuck in place by the welder.

The next step was to drill $\frac{3}{8}$ -in. holes, 2 in. apart, in outline around the straps and along the shallow groove. These holes then were tapped out and steel studs screwed in and



Fig. 2.—Close-up of section of repair job showing straps, studs and outline.

broken off flush. Metal then was deposited along the line of studs, around the ends of the straps, making an outline of the whole patch. This outline then was filled in toward the center in a manner similar to that of a deckhand in coiling a piece of rope from the periphery toward the center of the coil. When the job was completed the whole crack and a space of from 3 to 5 in. on either side was cov-



Fig. 3.—Finished repair job showing leaks which soon stopped themselves.

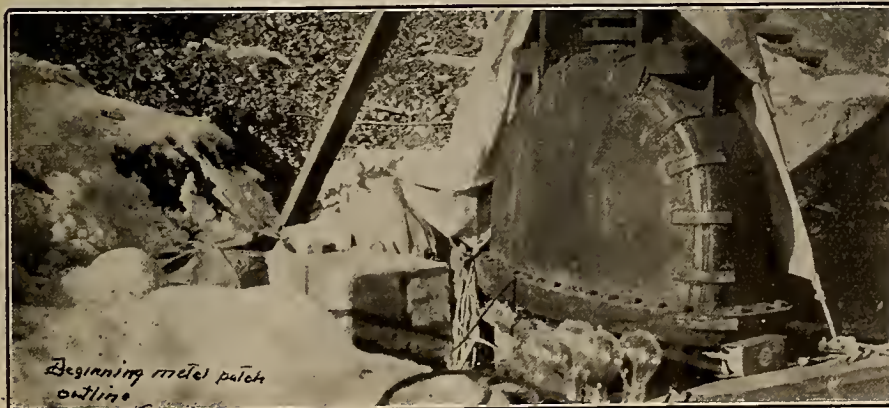


Fig. 1.—Difficult conditions under which valve repairs were made. Shows straps, rows of studs and start of patch outline.

ered completely with deposited metal. The depth of this deposition was from $\frac{1}{4}$ to $\frac{1}{2}$ in.

Under 48-lb. pressure the repaired valve developed several minor leaks when first restored to service. However, all of these stopped themselves within a few days and the valve has remained in full service for more than two years since the repair.

Suburban Capacity Increased by Cut-Over to 4 kv.

By R. H. Taber, San Diego Consolidated Gas & Electric Company, San Diego.

The problem of supplying adequate primary feeder capacity for increasing power and lighting loads in rapidly developing urban or suburban districts may be met in several ways: by additional feeders from generating or substations, by increased copper in existing feeders, or by increased voltage on existing feeders.

Where 3-phase, 2.3-kv. primary distribution feeders are in use and generating or substation conditions permit, current practice shows a marked trend toward the last of these expedients. Modification to 4-wire, 4-kv. distribution offers at once a relatively large increase in load capacity with only minor changes in transformer equipment and with simple line alteration at minimum cost.

During the last 2½ years the San Diego Consolidated Gas & Electric Company has found the 4-kv. distribution system most satisfactory for many of the most important urban feeders in residential districts. As a result this lately has been extended to a number of the suburban feeders.

Conversion from 2.3 to 4-kv. though not a difficult process, requires particularly careful attention to detail on the part of the line foreman. Detail may be reduced to a minimum by the use of a plat of the district showing the complete feeder with all 2 and 3-wire extensions, on which are spotted the distribution transformer stations, their capacity and the phase to which they will be cut for balanced load at 4 kv. One of the first steps in making the change is the installation of a temporary substation to maintain service at 2.3 kv. while making any necessary alterations in the main substation for 4 kv. After the extra copper for the fourth wire and such extra phase-wire extensions as may be necessary has been strung, insulators changed and other details completed, the fourth wire is tied to one phase of the existing 2.3-kv. supply and all single-phase load cut over according to the district plat.

Three-phase distribution stations require special attention. If equipped with 3-phase, 2.3-kv. transformers with no 4-kv. taps, the transformers must be changed. The cut-outs on all 3-phase stations should be pulled just prior to actual line-voltage cut-over and taps changed on 3-phase transformers, or one phase reversed if open delta. A rotation check also is advisable.

Sunlight intensity in an open field is 8,000 ft.-candles; in a street between buildings—3,000 ft.-candles; in the shadow of a building—300 ft.-candles; in an ordinary office—from 100 ft.-candles on the north side to 20 ft.-candles in the center of the room.

IDEAS FOR THE CONTRACTOR

Electrical Equipment in a Citrus Packing Plant

Exeter Citrus Association Uses Electric Heat in Coloring Process and Also Has a Large Motor Installation

The use of electricity in the citrus packing industry has grown rapidly in the last few years until nearly all of the operations now are performed by electricity. The Exeter Citrus Association plant in Exeter, Calif., is an outstanding example of a modern plant. In it there are many conveyors for automatic handling of boxes and fruit, and electric air heaters are used in the sweating process to bring out the color of the fruit.

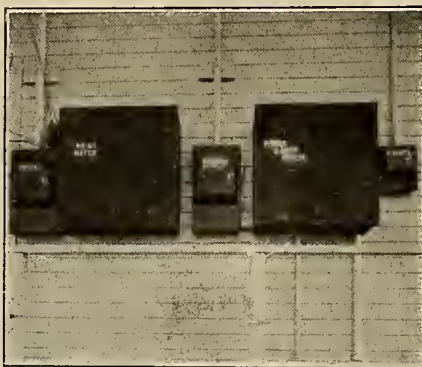
Electricity for power and heating is supplied from 110-220-volt, 3-phase current. The installation includes 16 circuits for electric air heaters and provision is made for 15 motors. In addition there are 14 lighting circuits.

The full boxes of fruit are placed on a conveyor directly from the trucks which bring them to the plant; this conveyor leads to an elevator which automatically dumps the fruit when the box reaches the top, the fruit going one way and the box the other. The boxes continue on a conveyor back outside to the loading platform where they may be placed on the trucks.

The fruit then is cleaned by passage through a series of dry brushes, whence it goes to the grader. If the fruit is too dirty to be cleaned in this manner, it is diverted before reaching the dry brushes and is passed through a pan of water and over a group of spiral brushes, then it travels up an elevator consisting of a series of rollers and then is passed under a series of fans to dry it. The travel under the drying fans extends over a

total distance of 60 ft., consisting of a run of 30 ft. and back. There are 12 drying fans, all on one shaft and operated with one motor. The dry fruit then is conveyed to the grader.

Nine girls divide the fruit into four grades: extra fancy, fancy, choice, and standards. The fruit then passes to the sizers where each size falls into



Main switches and meter cabinets for the Exeter Citrus Association. The air heaters are metered separately.

the proper bin. It is packed from the bins into boxes which are placed on conveyors which take them to the press where the boxes are nailed up. From there they are conveyed to the railroad car for shipment. The only manual operations in the whole process of packing are the grading and wrapping of the fruit.

The installation and control of all motors is interesting. They are all Fairbanks-Morse motors, controlled with General Electric CR 7006-D4 magnetic switches. All motors on the main floor are controlled from a central control station by the head grader. This station is elevated so as to give the operator a clear view of the entire plant, with its multiplicity of conveyors and belts. Each motor has its start and stop button at this station, and there is one master control which stops all motors in case of emergency. In addition to this station, the two motors driving the fruit-box elevator have emergency stop-switches in the basement. There are also lock-stop switches for the fruit elevator.

When necessary the color in the fruit is brought out by the sweating process using ethyl gas. The fruit is placed in sweat rooms in boxes, and then the temperature is raised to 76-80 deg. F., at which it is maintained from three to four days, depending on the color of the fruit. Ethyl gas is injected into the room three times a day. The heating in the sweat rooms is done with electric air heaters made by the Exeter Electric Company. They consist of commercial strip-heaters mounted in heater frames. The heating load in the sweat rooms totals 75 kw. An auxiliary operating panel is located on the main floor for breaking the circuits in the sweat rooms; the fuses on these circuits are located in the basement. There are nine sweat rooms, three of them being on the main floor and each having a capacity of 1,200 boxes of fruit at a time; six larger sweat rooms in the basement of the plant have a capacity of 1,750 boxes each.

During the 1926 season this plant



Lighting panel, disconnecting and magnetic switches for the motors in the Exeter Citrus Association plant. The head grader controls all motors on the main floor from the raised platform back of this board. The gutter for the control switches may be seen above the lighting cabinet.



Dirty fruit is washed and then dried by passing under a series of fans; these drying fans as well as the motor which operates them may be seen in the background. The conveyor on the left carries the fruit under the fans. The motor in the foreground operates dry and washing brushes.



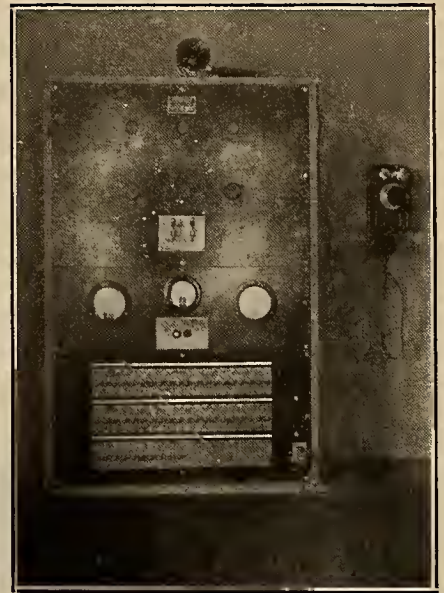
One of the sweat rooms on the main floor, showing one of the electric air heaters. The auxiliary operating panel for the air heaters may be seen on the extreme left.

expects to pack 150 cars of fruit, averaging 462 boxes to the car, or a total of 69,300 boxes. The plant packs oranges and grapefruit. Navel oranges usually are packed during November and December and the Valencias in May and June.

Benjamin RLM reflectors with 100-watt lamps on 12-ft. centers are installed for lighting. The offices of the plant are heated electrically, and duplex convenience outlets are installed for use of electric office equipment.

Chase nipples are installed between

the disconnecting switches and the magnetic switches controlling the motors. In this way it was possible to improve the appearance of this board which is located in a conspicuous place on the main floor. Trumbull switches are used throughout the job. The ground wires are all in conduit and none of them are smaller than No. 6. All of the wiring is in galvanized conduit and rubber-covered wire is used exclusively; all receptacles are porcelain. The electrical installation was made by the Exeter Electric Company.



The audio frequency amplifier station installed in the principal's office.

battery is installed for the telephone system. The electrical installation was made by the Nielsen-Smith Electric Company of Santa Barbara.

Extensive Loud-Speaker System Is Used by School

Modern Loud-Speaker Equipment and Telephone Call System Installed in Santa Barbara High School

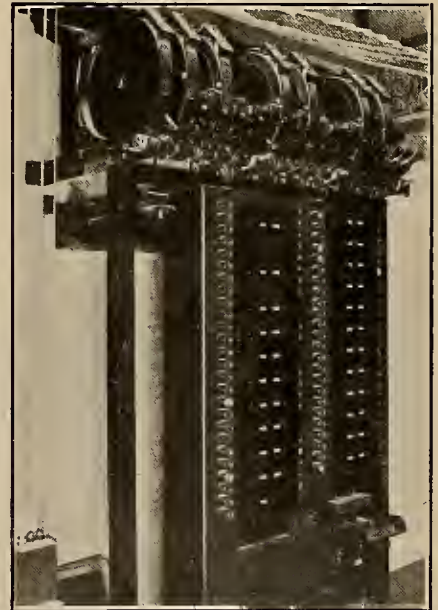
An excellent example of modern loud speaker equipment and telephone call system is that installed in the high school at Santa Barbara, Calif.

A Magnavox audio frequency amplifier is installed in the principal's office. From this station it is possible to speak to every room in the building at once or to any one individually, loud speakers being installed in each room. The system may be connected to a radio set, and any particular program may be heard by all of the students without any of them leaving their rooms. This eliminates the confusion and time lost

in gathering of students together in a central auditorium. It is planned to receive programs such as the president's inaugural address and others of an educational value.

The telephone call system provides that the principal may call any room, and, after talking with the teacher in that room, the loud speaker in the room may be connected directly with the principal's office by merely throwing a switch.

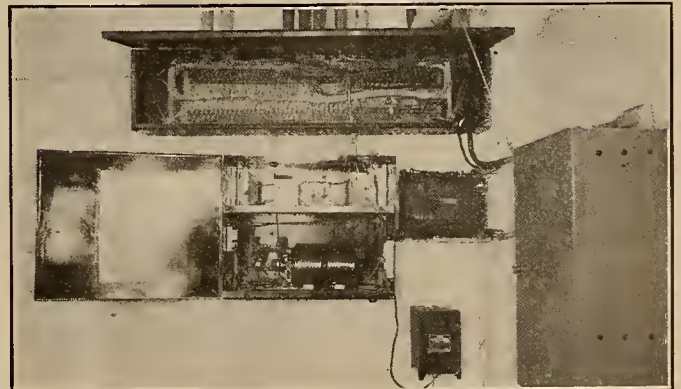
The small motor-generator set in the boiler room provides power for the tubes in the amplifier, while a storage



The stage board in the main auditorium. Cutler-Hammer dimmers are installed above the board proper; Demco protected-type switches are installed at the bottom.



The Santa Barbara High School contains a complete loud speaker and telephone call system.



Motor-generator set, storage battery, and telephone connections in the boiler room in the Santa Barbara High School.

Electrical Estimating for the Contractor — IX

Continuing the Discussion of Belt and Line-Shaft Problems Met by a Contractor in the Power Installation Field

By J. R. WILSON,* Engineering Department, Los Angeles Electric Works.

Information pertaining to belts is very desirable to have for reference. The data presented here are additional to those contained in the previous article of this series. Leather belts always should be run with the grain or hair side to the pulley. A belt made of firm leather cut from the back or center of the hide run grain side to the pulley will draw 35 per cent more than the flesh side to the pulley, 50

per cent more than rubber and 120 per cent more than canvas.

It is sometimes desired to change the speed of a machine, and this usually is done by changing the size of the driving pulley on the line shaft. If the pulley is larger than the old one it will be necessary to piece the belt, thereby making it longer. One and one-half times the difference in the diameter of the new and the old pulley will give the length of piece.

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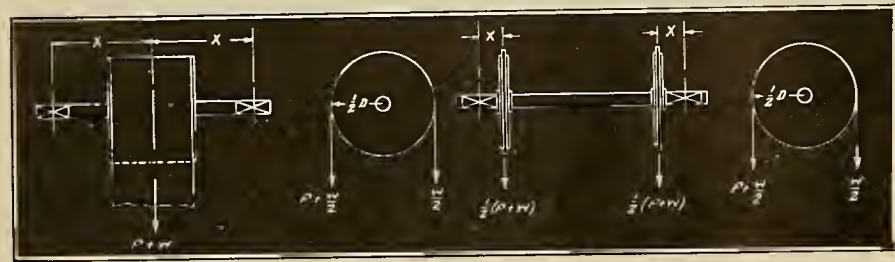


FIG. 1

The following formulae apply to both of the above diagrams: Where P = unbalanced load, pounds
Bending moment = $\frac{1}{2} \times (P + W)$ W = suspended weight of elevator, pounds
Torsional moment = $\frac{1}{2} DP$ D = diameter of sprocket, inches
Expressing P (unbalanced load) and torsional moment in terms of factors most generally known, we have:
$$P = \frac{33.3 \times \text{tons per hour} \times \text{feet lifted}}{\text{feet per minute}} = 33000 \times \frac{\text{Horse Power}}{\text{feet per minute}} \text{ (Pounds)}$$
$$\text{Torsional moment} = \frac{63.6 \times \text{tons per hour} \times \text{feet lifted}}{\text{Revolutions per minute}} = 63030 \times \frac{\text{Horse Power}}{\text{R. P. M.}} \text{ (Inch Pounds)}$$

CHART 1

For a more exact determination of the size of shaft to be selected, it is advisable to figure both the torsional and bending moments. This especially should be done for heavy strains and for slow speeds. We give herewith the formulae for these moments as they occur in ordinary conveying and elevating work, and in the chart below the two moments may be combined for the selection of the shaft diameter.

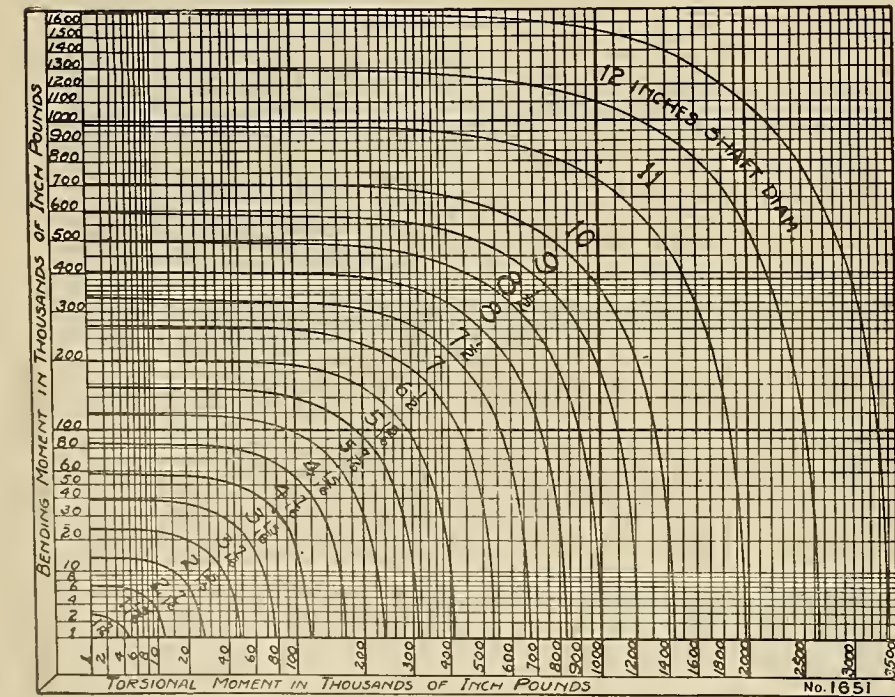


Chart based on a unit stress of 10,000 pounds per square inch.
The formula for combined bending and torsional stresses from "Merriman's Mechanics" from which this chart was plotted is as follows:
$$S = \frac{1}{2} S_b + \sqrt{S_t^2 + \left(\frac{1}{2} S_b\right)^2}$$

Resisting Bending moment = $S_b \times 0.098 d^3$ Resisting torsional moment = $S_t \times 0.196 d^3$
Where S = combined stress S_b = stress due to bending S_t = stress due to torsion

Sometimes it is desired to know the number of square feet in the face of a pulley. To find this proceed as follows: multiply the diameter of the pulley by 3.14 to get the circumference, multiply this result by the width of the pulley in inches, divide the result by 144 and the answer will be the number of square feet. Table 6 gives the horsepower transmitted by leather belts, and for estimating purposes this table will be nearly enough correct for all except special cases.

Belts never should be the full width of the pulley as a slight difference in alignment would cause the belt to run off the pulley and might cause destructive rubbing on the edge of the belt where a flange or other projection came in contact with it. On small pulleys single leather belts are best to use if they will carry the load. If the installation should indicate a single belt whose width would be more than $1\frac{1}{2}$ times the diameter of the smallest pulley, it should not be used. A narrower light double belt would be the proper type to use. As a general rule double belts never should be used on pulleys of less than 12 in. diameter if it is possible to avoid it. A minimum of 20 in. would be still better.

Usually a belt which weaves back and forth on a pulley indicates one of two things: misalignment or a belt too heavy for the load. This condition is accentuated in the case of an intermittent load. When the belt is fully loaded it will run straight on the pulley, but if the load is reduced suddenly the belt will weave.

It is of fundamental importance that the belt tension be correct. A belt which is too tight creates excessive friction at the bearings and also overstrains and injures the leather. A belt which is too loose will jump off the pulley especially if the load is intermittent. Large belts have been known to tear down shaftings and hangers, due to being too slack and leaving the pulley. Up to a certain point the slacker a belt can be run and still carry the load the more economical it will be. Another factor to be considered is the fact that certain kinds of belting expand and contract due to changes in the weather. This applies particularly to chrome leather, and it is possible to burn out babbitt bearings and pull down shaftings if belts are put on too tight.

More belting is ruined by improperly-lined shafting than any other one cause. Under this condition belts will be strained and usually will break apart on one end. This will cause the belt to run off the pulley and be torn apart. It should be kept in mind that because shafting was once in line it does not necessarily mean that it will remain so. Frequent inspection of line shafting should be made a rule of any installation and always will pay large dividends in belt economy. Most people seem to be under the impression that a belt drive consists simply of two pulleys placed in approximately a straight line with a band of leather stretched between them. Proportion, size and type of belting are given very little consideration, with the result that the installation is not based upon correct fundamental principles and therefore could never be a success from an economical standpoint.

The following simple rules will

assure the highest degree of economical operation for a line-shaft installation.

Place one man in charge of the belt drives and hold him responsible for the upkeep of the equipment. Furnish him with the necessary tools and replacement parts that will be needed in case of a breakdown. The duration of a shutdown depends upon the time spent in making the repair and this in turn is dependent upon the length of time needed to assemble the necessary repair parts. Give him a small room or at least a locker where he can keep these parts ready for instant use. (Remember a 10-minute shutdown with 60 men idle means a loss of 600 minutes, or 10-man hours of lost production.) He should make a careful inspection of each belt at frequent intervals and should look for the following defects:

- 1. Belt over-dry or oil soaked.
- 2. Too much belt dressing.
- 3. Laps have started to open up or connectors broken loose.
- 4. Too slack with consequent slipping.
- 5. Shafting out of line, loose hangers or worn bearings.
- 6. Belts badly worn and will need to be replaced.

Records should be kept of all belts, giving size, make, price and life performance.

The previous installment of this series gave instructions on figuring the horsepower of belts and stressed the fact that it was false economy to buy any but the highest quality of belting or to use a belt unfitted for the work it was desired to do. Very little time need be spent on the subject of line shaft hangers. The suppliers of this product usually are competent to furnish hangers of the proper design and strength for all the standard sizes of steel shaftings. Usually the question of selection is merely whether to use ball or roller bearings or babbitted type, ring oiling, self-oiling or grease-cup type.

The poor reputation that line-shaft drive has gained with some people usually is based upon hearsay or upon some unfortunate personal experience with a poorly designed layout.

In the first case the trouble begins immediately and continues until something finally gives way. In the second case the factor of safety is of course very desirable and future growth of the plant may justify the first cost. The cost of shafting is based upon weight per foot and a 3-7/16-in. shaft weighs twice as much as a 2-7/16-in. and three times as much as a 1-15/16-in. shaft. The hangers and supports and cost of erection will of course be greater as the size increases, so a standing investment in useless and unnecessary capacity is very seldom desirable.

Where a shaft unfitted for a particular installation has been specified it usually is found that the person making the layout did not understand the rule for figuring line-shaft capacity. This rule is based upon maximum demand and may vary through a large range, even in plants producing the same product. This demand factor is regulated by the method followed in the operation of the machines connected with the line shaft. Where most of the machines are in operation at the same time the demand upon the

TABLE 6

Horsepower Transmitted by Belts												
Single Leather Belting												
	Width—Inches											
Speed Ft. Per Min.	1	2	3	4	5	6	8	9	10	12	14	16
	Horsepower											
600.....	1	2	3	4	5	6	8	9	10	12	14	16
1,200.....	2	4	6	8	10	12	16	18	20	24	28	32
1,800.....	3	6	9	12	15	18	24	27	30	36	42	48
2,400.....	4	8	12	16	20	24	32	36	40	48	56	64
3,000.....	5	10	15	20	25	30	40	45	50	60	70	80
3,600.....	6	12	18	24	30	36	48	54	60	72	84	96
4,200.....	7	14	21	28	35	42	56	63	70	84	98	112
4,800.....	8	16	24	32	40	48	64	72	80	96	112	128
5,400.....	9	18	27	36	45	54	72	81	90	108	126	144
6,000.....	10	20	30	40	50	60	80	90	100	120	140	160

Double Leather Belting												
	Width—Inches											
Speed Ft. Per Min.	4	6	8	10	12	16	20	24	30	36	40	
	Horsepower											
400.....	4	6	8	10	12	16	20	24	30	36	40	
800.....	8	12	16	20	24	32	40	48	60	72	80	
1,200.....	12	18	24	30	36	48	60	72	90	108	120	
1,600.....	16	24	32	40	48	64	80	96	120	144	160	
2,000.....	20	30	40	50	60	80	100	120	150	180	200	
2,400.....	24	36	48	60	72	96	120	144	180	216	240	
2,800.....	28	42	56	70	84	112	140	168	210	252	280	
3,200.....	32	48	64	80	96	128	160	192	240	288	320	
3,600.....	36	54	72	90	108	144	180	216	270	334	360	
4,000.....	40	60	80	100	120	160	200	240	300	370	400	
4,400.....	50	75	100	125	150	200	250	300	370	450	500	

line shaft naturally will be greater than where only a small percentage of the group is working.

To determine the proper size of shaft it is necessary to know the horsepower-demand of each machine. This can be obtained from the firm supplying the machines. By adding together the horsepower-demand of the machines which are to be operated continuously we will obtain a base figure which will represent the minimum horsepower-demand on the shaft. By adding thereto the largest intermittent demand which will be made upon the shaft, we obtain the maximum load that the shaft will have to carry.

The proper size of shafting is regulated not only by the maximum demand as noted above but also by the torsional and bending stresses imposed by the heavier machines, especially at slow speeds. Three factors enter into the determining of these stresses: the weight of the pulley, the tension of the belt and the distance the pulley is placed away from the nearest hanger. It readily may be seen that with a heavy pulley the bending stress even with a slack belt, will increase very materially as the pulley is moved away from the supporting hangers. The maximum stress of course is reached at the center of the span. As an example of the effect of this bending stress on the capacity of a given size of shaft, let us consider a typical example. As was stated in the previous installment, "The effective belt tension is the difference in tension between the two sides." An example of this would be a belt where the speed was 3,500 ft. per min. with an effective tension of 76 lb. The capacity of the belt would be 8 hp.

It usually is estimated that the ten-

sion on the tight side of the belt will be about twice what it is on the slack side. In the example noted above the tension on the tight side would be 152 lb. and on the slack side would be 76 lb. If we assume 152 lb. as the weight of the pulley we have a bedding stress of 380 lb. In general practice a maximum of 8 ft. between hangers is about right. If we place our pulley half-way between hangers each hanger will carry one-half of the weight. The center distance will be 48 in. and the weight will be one half or 190 lb. The formula would be

$190 \text{ (lb.)} \times 48 \text{ (in.)} = 9,120 \text{ in. lb.}$

It will be seen that the bending stress is increased with an increase in distance between hangers, even though the pulley weight remains the same. If we maintain our 8-ft. hanger spacing and place our pulley only 8 in. away from the nearest hanger, the result would be:

$332.5 \text{ (lb.)} \times 8 \text{ (in.)} = 2,660 \text{ in. lb.}$

This example is given to explain the desirability of placing heavy pulleys as close as possible to the supporting hangers. Where there is an indication of possible excess stresses an extra hanger always should be provided to minimize these stresses as far as possible. Line-shaft deflection never should be more than .01 in. per ft. If this limit is exceeded very likely it will be the cause of broken pulleys, especially if they be of a cast-iron type.

The determination of line-shaft stresses will be more clearly understood by consulting Fig. 1 and chart 1 shown herewith. The captions explain the formula used.

Additional tables containing valuable information pertaining to line shafting will be given in the next article.

BETTER MERCHANDISING

And Now — Electric Coffee

National Campaign for April Is to Feature the Percolator as
the Necessary Companion of the Toaster

Percolators, by virtue of their elaborateness, distinctive appearance, and in some cases, cost, long have been looked upon by the average family as something of a luxury which would have to be postponed until the fabled ship came in. In a measure this circumstance has been the greatest sales resistance encountered by the merchandiser of those very useful, if sometimes ornamental, appliances.

But it is also true today that while there are still beautiful percolator sets, which the average family may look forward to owning in the sweet by-and-by, there are many inexpensive percolators which can be sold to bring home the use of this appliance as a perfect coffee-maker in the present "buy and buy." Once using an electric percolator, it is safe to estimate that no family will return to the coffee pot and that its next percolator may be the more elaborate one upon which it has fixed its hopes for so long.

Electric irons have come to be an accepted appliance. Few homes today are without them. The toaster, too, is coming into the same acceptance through persistent advertising and demonstration. The vogue for toasted sandwiches at the present time is an outgrowth of the advertising done on electric toasters. These sandwiches, electrically toasted, themselves are selling toasters where toasters never went before.

It is particularly interesting to notice, too, that electric percolators are beginning to be used in a like manner in commercial eating houses, displayed prominently as an advertising feature. This may be realized as the outgrowth of advertising of electric coffee-making.

So, with acceptance on the wave, now is the time to push percolator sales as never before. And because the percolator is not a spectacular appliance, this effort must be made ingeniously and persistently. A washing machine with plenty of action is an attractive piece of apparatus. A new electric refrigerator with its self-contained ice plant is likewise a spectacular piece of apparatus. The vacuum cleaner, too, is spectacular.

But it is well to remember that the iron, though quite an unromantic bit of mechanism, with no motion, no visible signs of action, has been sold in nearly every home in the country on its sheer usefulness. Even in foreign countries, where practically no other electric appliance is yet being

sold, the electric iron has found a market.

The same must be accomplished for the percolator. It must be sold on its sheer usefulness and superiority to the old coffee pot, for it is as superior to the coffee pot as the electric iron is superior to the old sad-iron. Sales appeal must be based largely upon that fact.

Points to Feature in Selling Electric Percolators

There isn't a multitude of sales arguments to be used in percolator selling. The salient features of superiority can be counted on your fingers, but the same is true of the electric iron. These features must be hit hard and often. Their very terseness is something of an advantage for there isn't so much to sell to a customer that the effort may become dissipated. This about sums them up:

(1) Better Coffee—Its secret isn't so much in the brand used but in how it is made. Electrical coffee is coffee made in the very best possible way. It is percolated at just the right speed and heat to drain every drop of flavor from the coffee bean. Good coffee can be made better on an electric percolator.

(2) On the table, electrical coffee is made. And if one wants another cup it is right there, ready. There is no need to get up to go to the stove or to the kitchen. This is the convenience idea expressed in coffee.

(3) Quickness is another feature. The electric percolator is designed to prepare coffee in just the right amount of time, and that is surpris-

ingly quickly. There is less chance of burning the coffee from too hasty preparation or of waiting too long for it to simmer.

(4) It is clean. The electric percolator can be rinsed out with warm water and put away until it is used again. There will be no necessity for cleaning sooty coffee pots. This item appeals to any housewife.

(5) Ideal for entertaining. After the theater, or in entertaining visiting friends, the percolator provides a quick, clean means to present the present-day cup that cheers. The toaster is coming into its most prominent place as an aid to the hostess, and the waffle iron, too, is being used as the chef for many a bridge evening. For these the percolator is an indispensable ally. And the percolator which is used for these purposes to the best advantage is that which is accompanied by an appropriate creamer and sugar bowl.

What to Do 'Til the Order Comes

National advertising in all the leading home periodicals will announce the percolator campaign. Many of the jobbing and distributing agencies for these appliances also plan local campaigns of advertising. It would be well for the electrical merchandiser himself by his own advertising to point the way to the prospective customer as to where he may buy these appliances.

"Here is where you may get that percolator that you have been told of," his message may well be. He may make it as convenient for the pur-



Spring ushers in the percolator at the Public Service Company of Colorado, with this poetic Spring-like window display of percolator sets. The percolators vie with the flowers in this pretty garden scene. Reflected color in their shining nickel and silver surfaces makes them easily the most attractive things in the window.

chaser to buy his particular brand of percolator, when that customer is in the mood for one, as it is possible to do.

Window displays are necessary. In fact, if every store in town which handles percolators makes a display of these appliances at the same time—in April—no shopper will miss being reminded that this is the exactly right time to buy percolators. Whether the price is lower than ordinary or not, a concentration on percolators in April is sure to bring results.

Some central stations may start house-to-house campaigns. Even this should encourage the lone dealer, for experience has shown that when the central station makes a big advertising effort on some particular appliance every dealer in that territory sells more of those same appliances than at any other time. The stimulation given to the buying urge by the general campaign reflects to the benefit of all who merchandise.

Remember that the electric percolator is the natural companion of the electric toaster and the electric waffle iron. Where you can sell the one, a little extra sales effort will result in the eventual sale of the other two. If electrical coffee can be made a household word, the percolator will find itself in a class comparable with the electric iron.

Byllesby Merchandising Extends to Coast Properties Soon

Arrangements are already in process for the starting of merchandising by a number of Western Byllesby properties, according to a recent announcement in "Byllesby Management," made by J. W. Devereaux, assistant to the vice-president in charge of operations of the Byllesby Engineering & Management Corporation and especially in charge of merchandising. A start was made last year in the Oklahoma and Minnesota properties of the company. It is to be followed this year with merchandising activities first by the Western States Gas & Electric Company and later all other Western properties.

The Southern Colorado Power Company, Mountain States Power Company, Coast Valleys Gas & Electric Company, San Diego Consolidated Gas & Electric Company, Western States Gas & Electric Company and the California Oregon Power Company have arranged to expand their merchandising activities this year in accordance with Byllesby standards of store arrangements and merchandising and advertising methods.

In making arrangements to push the sale of appliances, especially electrical appliances for the home, it is not the intention to interfere in any way with activities of local dealers. Regarding this phase of the situation, Mr. Devereaux said:

"There were some dealers who were not in sympathy with the movement and it was necessary to let them know what our policy was going to be; but inasmuch as there is nothing new in our method for getting business from that which they might try, the dealers as a rule were satisfied after hearing our side of the question.

"As time has gone on we have had nothing but good news from the deal-

ers. They report good business and some of them have stated that they have sold more appliances since we have been in business. These statements are now being checked up in the hope that this department can have definite information as to how they now feel about our merchandising efforts.

"Where the utility consistently goes about its business of selling appliances to customers, continually talking up the advantages of doing things electrically and advertising its wares, there will be considerably more appliance business for dealers than where the central station company is content to permit control of this important source of revenue to drift into the hands of those who care little about the quality of the goods they sell and still less about the interests of the

customer or the utility. The central station industry in its need for more revenue per customer can ill afford to experiment with indifferent outside agencies for increasing its business."

The appliance sales department of the Byllesby organization has worked out a comprehensive set of rules covering standardization of equipment and methods. These rules form the basis on which merchandising activities will be carried on at all properties in the future.

Utility Opens Radio Sales Department.—A complete radio department has been organized by the Public Service Company of Colorado and placed under the direction of James Eakins, formerly one of the commercial representatives.

An Every-Day Percolator

That You Will Use



1

For Your Old Coffee Pot

Announcing Our Second Annual

Electric Percolator Event

STARTING SATURDAY, MAY 16th--Featuring an 8-cup Pure Sheet Aluminum Electric Percolator--Complete with Plug and Cord--Remarkably Low Price--\$5.75

The second of these extraordinary Percolator Events--featuring an improved Pure Sheet Aluminum Electric Percolator in the 8-cup size. A far better value than the one offered last year. Improvements and refinements have been added, but price and terms remain the same.

The most delicious coffee can be made in this percolator right on the table before you. Think how convenient it is. It's aluminum and will not tarnish.

Don't Pass This By--Buy Now!

It's the Best Value We Ever Offered in a Percolator

\$4.75

IF YOU BRING AN OLD COFFEE POT

SHOWING 1000 OLD COFFEE POTS WHICH WERE TURNED IN DURING OUR GREAT PERCOLATOR SALE LAST YEAR

Sale Starts Saturday, May 16th, at 8 a. m. Sharp.

VALLEY ELECTRICAL SUPPLY CO.
PHONE 3397 FRESNO SAN JOAQUIN POWER BLDG.

BRING an OLD COFFEE POT

All Mail Orders Shipped Prepaid

Easy Terms
You only have to pay One Dollar, and turn in an old Coffee Pot for One Dollar, the balance of \$3.75 may be paid in three equal Monthly Payments of \$1.25 each.

Again looking to the Valley Electrical Supply Company of Fresno for a telling sales idea, one comes upon this effective broadside and advertisement used in a percolator campaign last year.

NEWS OF THE INDUSTRY

Further Details of Denver's Municipal-Ownership Plan

Supplementing the announcement of the proposed plan to introduce municipal ownership into Denver (Journal of Electricity, March 15, 1926, p. 234) additional details of the project have been received from that city. The proposal to utilize the waters of the South Platte River for a municipal water supply and hydroelectric generation was made by the Fargo Engineering Company of Jackson, Mich., James H. Causey, financier, and the engineering firm of Wood & Webber, Denver.

As a result of the introduction of the Two Forks project into the Denver water-supply situation and the criticisms over the arrangements being made by the water board to utilize the pioneer bore of the Moffat Tunnel for bringing water to the city, three recently appointed members of the water board have resigned. They are Ernest Stenger, president of the Denver Tramway Company, F. W. McCarty, capitalist, and Sam Perry, coal-mining magnate. These men had been appointed by Mayor Stapleton to iron out the water-supply situation.

The attitude of the Public Service Company of Colorado, whose franchise in the city of Denver expires May 15, 1926, has not been expressed. The proposal calls for the purchase of the energy output from the proposed hydro stations by the utility company.

To supplement the work of H. B. Dwight, electrical engineer of the Colorado Utilities Commission, who has been loaned to the city to make a valuation of the properties of the Public Service Company before a franchise agreement is reached, the city has retained Rae Palmer, New York electrical engineer, in a consulting capacity. Mr. Palmer will supervise the work of checking the valuations of the utility's property to be used as a basis for rates to be decided by the franchise.

Power Company Orders Equipment for Buck's Creek Plant

Orders have been placed by the Feather River Power Company for power house equipment to be installed in its Buck's Creek plant where water will be utilized under 2,350-ft. effective head, the highest head yet developed in this country.

The hydraulic equipment is to be designed, built and installed by the Pelton Water Wheel Company of San Francisco, and will consist of two 35,000-hp. double-overhung impulse turbines complete with governor actuators, oil-pressure system, hydraulic cylinder-operated gate valves and other auxiliaries. Two impulse wheels of 450-hp. capacity each also will be

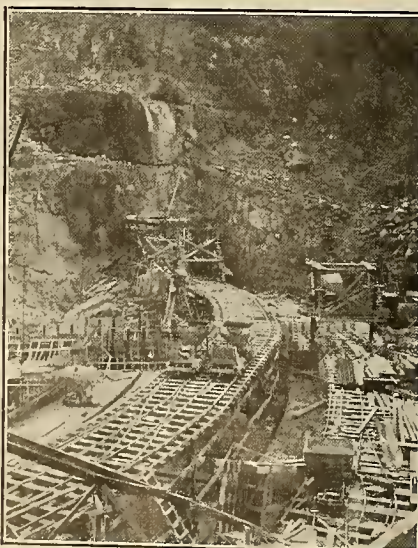
furnished for driving the exciter units. Each turbine will be direct-connected to a 25,000-kva. generator, these to be furnished by the General Electric Company, whose contract covers all the electrical equipment for this plant. The entire plant output will be purchased by The Great Western Power Company of California. (Journal of Electricity, Oct. 1, 1925, p. 265).

Grays Harbor Company Remodels Aberdeen Headquarters

A public reception recently celebrated the completion of the remodeling of the headquarters of the Grays Harbor Railway & Light Company at Aberdeen, Wash.

The offices of W. W. Briggs, vice-president and general manager, and the heads of several of the departments, which were located at the back of the second story, have been moved to the front part of the building. The walls of all the offices and the hallways have been retinted, the woodwork has been repainted and the lighting fixtures modernized.

Federal Light & Traction Company Buys New Mexico Utility.—The Federal Light & Traction Company, New York City, has acquired the property and franchises of the Santa Fe Light & Water Company, Santa Fe, N. M. J. H. Bowles of the New York office of the company, and Arthur Prager, manager of the Albuquerque Gas & Electric Company, completed negotiations recently. Before the deal is completed the new company will ask for a vote of ratification by Santa Fe citizens.



The Melones project of the Oakdale and South San Joaquin Irrigation District as it appeared March 4, 1926.

Doherty Company Buys Colorado Utility Properties

Another string of utility properties shortly will be added to the Public Service Company of Colorado as the result of an agreement by Henry L. Doherty & Company to purchase the Grand Junction Gas & Electric Light Company, the Grand Junction Ice Company, the Palisade Light Company, and the Grand River Valley Railway Company, operating an electric interurban line between Grand Junction and Fruita, on the western slope of Colorado.

The central station at Palisade formerly was owned by the Hendrie & Bolthoff Manufacturing & Supply Company of Denver and was purchased by the owners of the Grand Junction properties about two years ago. These properties were controlled by a group of Colorado Springs capitalists headed by A. E. Carlton, president of the Holly Sugar Corporation, which maintains a large beet sugar factory at Grand Junction.

The Public Service Company will take over the Grand Junction properties about May 1, it is reported. In the meantime it is understood that negotiations are being conducted by the company for several municipally owned plants which will be added to the lines in accordance with the company policy to acquire desirable independent units adjacent to its territory.

Edison Company Orders Impulse Units of Record Capacity

Orders recently were placed by the Southern California Edison Company, Los Angeles, for two 56,000-hp. impulse units, which are said to set the world's record for capacity. They exceed by 16,000 hp. each the two 40,000-hp. impulse units installed in the Serra plant of the Sao Paulo Tramway, Light & Power Company of Sao Paulo, Brazil, that previously claimed the record. The impulse unit of highest capacity yet installed in this country is a 35,000-hp. unit in the Edison company's Big Creek No. 1 plant. This equipment, as well as that installed in the Serra plant, was designed and built by The Pelton Water Wheel Company, San Francisco.

The two 56,000-hp. units just ordered will be built by The Pelton Water Wheel Company and the Allis-Chalmers Manufacturing Company, Milwaukee, respectively, and will be installed as the first equipment in the Big Creek No. 2A plant, whose ultimate capacity is planned to be 300,000 hp. Both units are to be essentially identical, the normal effective head to be 2,200 ft., static head 2,420 ft., and the normal speed 250 r.p.m. for 50-cycle operation. Provision is made in each unit to permit 60-cycle operation at 300 r.p.m.

Power Project in Willapa Harbor District, Wash., Planned

Announcement of a \$1,540,000 electrical water-power project in the Willapa Harbor district that when completed will generate 10,000 continuous electrical horsepower, was made recently with the filing of water and reservoir applications at Olympia, Wash., by J. R. Snider of the Willapa Electric Company.

The storage in the natural reservoir of 272,000 acre-ft. of water will mean the submerging to an average depth of 60 ft. of 5,440 acres of land situated near Conto, eight miles northwest of the town of Raymond, according to information furnished R. K. Tiffany, supervisor of hydraulics. The project will require a dam 125 ft. high. The appropriation asked is 5,000 sec.-ft. of water from North River, which will be tapped at a point 150 ft. from the power plant proper.

Actual work of construction can be started April 1, 1927, provided the permit is granted, and should be completed not later than Jan. 1, 1929, it was said.

Colorado Utility Leases New Offices in Pueblo

A lease for offices in the new Colorado Building, to be erected at the corner of Fourth and Main Streets, Pueblo, has been signed by the Southern Colorado Power Company, which will occupy a portion of the main floor.

The new quarters will have a frontage of 30 ft. on Main Street and this section will be occupied by the cashier's and service departments, together with the merchandising department. Behind these departments will be located the clerical department and the executive offices. The entire frontage on Fourth Street will be occupied by the power company. Plans contemplate provision for space in the basement for the use of churches and charitable and civic organizations for bazaars and similar functions.

The Southern Colorado Power Company, which is a Byllesby holding, serves fifty-six cities and towns with a total estimated population of 100,000.

Pacific Gas and Electric Wins Decision in Suit

Applications for injunctions filed by the Market Street Railway Company against the Pacific Gas and Electric Company, both of San Francisco, to prevent the latter from collecting \$425,000 and accrued interest from the former have been dismissed by the federal court.

The filing of the injunction pleas followed the decision rendered by Judge Walter Perry Johnson of the superior court in the original suit brought by the railway company against the power company in a dispute over rates for electric power fixed by the California Railroad Commission (Journal of Electricity, Feb. 1, 1925, p. 112). The railway company contended that increases allowed by the railroad commission over rates stipulated in a certain agreement existing between the two companies were illegally authorized as the power supplied under the contract never became a public utility because the contract was private, thus barring the commission from jurisdiction. Judge Johnson ruled

in favor of the Pacific Gas and Electric Company.

The decision rendered by Judge Hunt of the United States Circuit Court and Judges Kerrigan and St. Sure of the United States District Court says in part:

Plaintiff's rights are to be measured solely by the external limits of "due process," and if there is no allegation that the commission transgressed those limits it has no standing in federal court; for here only constitutional questions may be considered. * * * The increases first made were temporary, were measured by accurate gages of increases, and were followed within a reasonable time by a rate based on full and complete valuations of the properties involved, which demonstrate their essential fairness.

Northwestern Company Seeks More Water from Elwha River

Enlargement of the originally outlined plans having been decided on, the Northwestern Power & Light Company, of Port Angeles on the Olympic peninsula, Washington, has filed additional applications with the office of the state supervisor of hydraulics in Olympia seeking reservoir rights and an additional appropriation of 200 sec.-ft. of water from the Elwha River.

Through permits previously issued (Journal of Electricity, July 1, 1925, p. 35) the company was given a 600-sec.-ft. appropriation which apparently has proved insufficient in estimating for the plant, which now is estimated to cost \$1,000,000 and is expected to be started prior to March 1, 1927. The total output of the plant is estimated at 16,500 continuous electrical horsepower. The reservoir under the application just made would store 50,000 acre-ft. of water and would be headed by a concrete dam 200 ft. high.

Walla Walla, Wash., Names Commission to Investigate Feasibility of Municipal Plant.—A city rate commission has been named by the city of Walla Walla, Wash., to investigate and report upon the feasibility of a municipally owned power and light plant and distribution system for the city. The city commission brought about a hearing before the department of public works, held in August, when Walla Walla and neighboring communities joined with Yakima in asking rate reductions from the Pacific Power & Light Company. Neither the city commissioners nor the rate commissioners are satisfied that the results of the hearing will afford the desired relief and consider a municipal plant the only recourse.

Option on Power Site Bought by Great Northern Railway

The Great Northern Railway advised the Washington state hydraulics office early in February that it had purchased for \$35,000 an option for a water-power site that upon completion of development will furnish an output of 35,000 continuous electrical horsepower for use in hauling its transcontinental trains through the 3½-mile Cascade tunnel. The site in question is 8 miles from the town of Scenic.

Plans include a concrete dam 100 ft. high and a conduit 3½ miles long to carry the water to the power house. The site carries with it diversion rights to 300 sec.-ft. of water. Construction is expected to be started within the next three months.

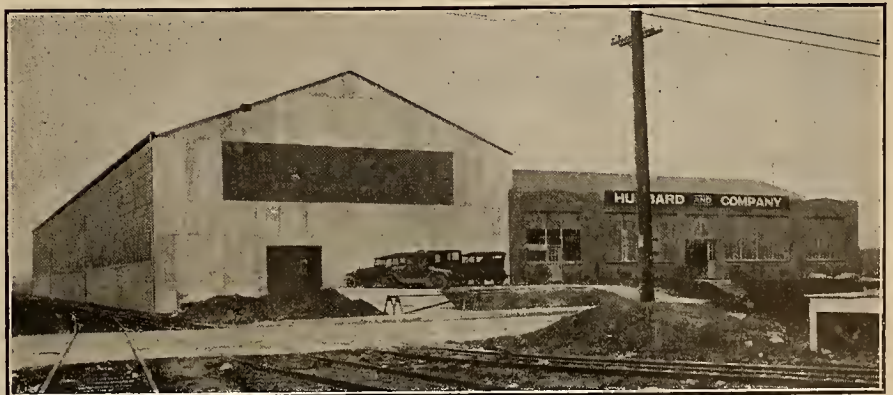
New Unit Added to Emeryville Pole-Line Hardware Plant

A new unit has been added by Hubbard & Company of Pittsburgh and Chicago to their plant at Emeryville, Calif. The concern, a large manufacturer of pole-line hardware and construction specialties, erected the first unit about a year ago, and the second unit now doubles the capacity of the plant for the manufacture of pole-line hardware. The Austin Company of California built both units.

Hubbard & Company's site occupies about six acres with a frontage of about 337 ft. on 45th Street between San Pablo Avenue and Hollis Street. The property extends 380 ft. along the Southern Pacific industrial track serving the district.

New construction occupies an area of about 205 x 170 ft., extension having been made to the yard storage building and improvement work carried out on the balance of the lot in the rear of the forge building. A crane runway aisle 40 ft. wide carrying a 5-ton crane has been constructed across the rear of the property extending a distance of 170 ft. The galvanizing and storage building is of brick and steel construction of saw-tooth design to afford ample light and ventilation. The front elevation on 45th Street is faced with brick to conform with the present structure. A railroad loading platform and a new entrance for trucks has been provided.

It is expected that other units will be added to the Emeryville plant and that ultimately all the company's other products also will be manufactured there.



The plant of Hubbard & Company at Emeryville, Calif., to which a new unit recently has been added.

News Briefs

West Fork of Kings River Excluded from San Joaquin Power Corporation's Development Project Permit Until Storage Rights Acquired.—The license issued the San Joaquin Light & Power Corporation covering a development on the North and West Forks of Kings River has been amended so as to exclude the West Fork from the project until storage rights have been secured. The addition of an upper development on the North Fork has been added to the project with the approval of the Federal Power Commission.

Doherty Company Acquires Independent Central Station at Brighton, Colo.—The acquisition of another independent central station by Henry L. Doherty & Company has been announced in the purchase of the Brighton Ice, Light & Power Company, Brighton, Colo. This company, which serves a prosperous agricultural community about twenty miles from Denver, has been operated for about fifteen years by M. R. Quinn and will be transferred to the Public Service Company of Colorado. Mr. Quinn and associates have incorporated a new company to continue operation of the ice and coal business.

Los Angeles Creates Street Lighting Department.—Street lighting problems have been found to occupy so much time that the city council of Los Angeles, Calif., has created a new department of city government to handle them. The new department is to be known as the street lighting department and is to work under the direction of the board of public works.

Denver League to Investigate Electric Traffic Control Systems.—Two special committees have been named by the Electrical League of Colorado to investigate and make a report on the electric traffic control signal systems which are being considered for installation in Denver. One committee is headed by Ernest P. Kipp with D. D. Sturgeon, A. E. Bacon, and R. G. Gentry. The other committee consists of Thomas W. Nixon, F. F. McCammon and Fred E. Staible.

Puget Sound Company Buys Avery Public Utilities.—Purchase by the Puget Sound Power & Light Company of Seattle of all the property of the Avery Public Utilities, consisting of the electric light and power distribution systems of Pe Ell, Lewis County, Wash., has been announced. The systems consist of seventeen miles of transmission and twelve miles of distributing line. These utilities have been purchasing their supply of current from the Puget Sound company.

Utility Incorporated in Centralia, Wash.—The Centralia Power & Light Company, Centralia, Wash., has been incorporated for \$50,000 by R. F. Hubbard, W. H. Copping, and C. D. Cunningham.

Northwest Electric Light & Power Association

Valuable Data Characterize Papers of Technical Section

Replete with technical material of particular importance to utility operation in the Northwest, the third annual general meeting of the Technical Section of the Northwest Electric Light and Power Association at Seattle, March 11-12, 1926, passed into history with a record attendance and a feeling of enthusiasm equaling that of past years. One hundred and fifty-one section members registered during the two-day session, and many took part in the presentation of twenty-odd papers on technical subjects and in the discussion on these subjects, which was necessarily short on account of the fullness of the regular program. Two features of the meeting were the presence of Col. William Kelly, director of engineering, N. E. L. A., New York, who addressed the meeting the first day on the work of his department of the national organization, and a remarkable address by Franklin T. Griffith, president, Portland Electric Power Company, Portland, on the "Relation of Public Service Men to the Public," published elsewhere in this issue of the Journal.

After the meeting was called to order by Z. E. Merrill, assistant general manager, Mountain States Power Company, Albany, Ore., chairman of the section, W. H. McGrath, vice-president, Puget Sound Power & Light Company, Seattle, welcomed the visitors, calling attention to the place of the engineer in the business, and saying that when the public comes to know more about the business it will focus greater attention on the work of the engineer. The response by Lewis A. Lewis, sales manager, The Washington Water Power Company, Spokane, and president of the association, expressed gratification at the work of the technical section which, he said, always had been one of the most conscientious of all the sections in the way in which it attacked its problems.

The accomplishments of the joint committee from the N. E. L. A. and American Telephone and Telegraph Company on inductive co-ordination formed the principal theme of the talk of Colonel Kelly, who was introduced at this point, though he spoke in part on the work of his department in connection with consolidating and co-ordinating the efforts of the various committees working on code revision.

Co-operation with Regulatory Bodies Theme of Address

The feature of the program of H. J. Flagg, assistant to the general manager, Grays Harbor Railway & Light Company, Aberdeen, Wash., chairman of this committee, was a talk by Claire Bowman, director of labor and

industries, State of Washington, Olympia. He stated that the power companies were interested in his department from three standpoints: accident prevention and cost, insurance cost, and public attitude. Saying that the department should be called an advisory body rather than a regulatory body, he impressed his auditors with the fact that his department wanted to help industry and expected the co-operation of industry.

Accident Prevention

J. B. Fiske, consulting engineer, The Washington Water Power Company, chairman of this committee, introduced as the first speaker M. E. Arkills, safety engineer, Water Front Employers, Seattle, whose subject was "The Economic Value of Accident Prevention." He showed some of the dollar-and-cents savings that could be effected through intelligent application of safety-first principles in an industrial enterprise, citing four companies that reduced their direct accident compensation costs during the period 1920 to 1923 an average of over seventy-six per cent. Some less tangible costs of accidents are: labor turnover, stoppage of work or service, lowering of morale and efficiency, and increased overhead.

"Selling Safety" was the subject of a paper by G. I. Drennan, field superintendent, Pacific Power & Light Company, Walla Walla, Wash., in which he said it was necessary in starting a safety program to begin at the president and sell every man and woman from there down. He said that the approval of the executives was necessary to get the money to carry on an educational program, which is a necessary part of any company's accident-prevention methods, and that the prosecution of such a program required the application of sales methods.

General discussion took up the necessity of installing certain safeguards on equipment which H. H. Schoolfield, chief engineer, Pacific Power & Light Company, Portland, said should be designed before construction, with the design submitted to the safety engineer for his suggestions before approval. H. A. Patton, electrical engineer, Washington Surveying and Rating Bureau, Seattle, called attention to the relation of life hazard to fire hazard, urging that in the zeal to protect the former one should not unduly increase the latter.

Inductive Co-ordination

Again the most interesting subject of this committee's work was the continued study of power company influence on radio reception, though Colonel Kelly's reference to the work

of the national committee called forth some supplementary remarks from the chairman, G. E. Quinan, chief electrical engineer, Puget Sound Power & Light Company, relating to the work of that committee on the relations of power and telephone lines. The subject of relations with radio reception was opened by E. F. Pearson, electrical engineer, Northwestern Electric Company, Portland, who read a paper prepared by L. H. Kistler, supervisor of meter department of that company, on "Radio Interference from the Power Company's Standpoint." Six causes of radio interference were listed in the order of their importance as follows: interference from various types of radio receivers; too many broadcasting stations operating coincidentally; customers' appliances and devices on power company lines; natural causes; lines and apparatus of power companies; and commercial or ship spark stations. Stating that the present system in many localities of asking the power companies to investigate all radio trouble placed an unfair burden on them, he suggested that a central clearing house for such complaints should be conducted by a broadcast listeners' association which should investigate complaints and turn them over to the proper agencies for clearance.

O. R. Redfern, supervisor of radio for the seventh district (the Northwest), next on the program, told of some of the complaints with which his office had to deal, citing the various types of medical machines in doctors' offices as being among the worst offenders. Such interference has been eliminated successfully by encasing the room in which the machine is situated with a fine-meshed, galvanized-iron wire-netting and then grounding this netting. Smelter interference has been reduced to a minimum by placing choke coils in each end of the precipitator lead. Atmospheric disturbances have caused much interference during the past winter.

Hydraulic Power

Opening the afternoon session, O. L. LeFever, superintendent, Northwestern Electric Company, chairman of this committee, made a brief survey of the more recent hydroelectric developments on the Pacific Coast, citing data collected by the Journal of Electricity, and immediately thereafter introducing Lyman Griswold, consulting engineer, Portland, to present a paper on "Rock and Earth-Fill Dams." Urging that engineers be not prejudiced in favor of any one type of dam to the

exclusion of all others but that they approach each project with open-mindedness, Mr. Griswold asserted that some projects, economically not feasible if concrete is used, can be developed with the use of rock and earth-fill dams well within the accepted economical limit of cost per horsepower. He cited numerous cases of such structures built in India, Egypt and Ceylon, before Christ, stating that these are still in service and that the failure of such structures is practically unknown.

Invited in for the purpose of discussing this paper, S. H. Hedges, Puget Sound Bridge & Dredging Company, Seattle, told of two jobs in Texas secured by his company, both of which involved large earth and rock-filled dams. Material was secured by dredging from the river bottom.

Contending for a broad conception of all the economic problems of the entire system, the paper by C. P. Dunn, designing engineer, Portland Electric Power Company, on "The Economies of Hydroelectric Design," showed that the following fundamental studies should be made before attempting to determine the size and type of a hydroelectric plant to fit into an existing system: rating of existing system, load forecasting, determination of general construction program, determination of general features of the individual project, and value of the power. The relation of each of these to the needs of the existing and prospective system was discussed in order.

Apparatus

In the absence of Walter Hendron, engineering department, Utah Power & Light Company, Salt Lake City, who was to have presented a paper on "Mechanical Troubles with Late Types of Oil Circuit Breakers," D. W. Proebstel, superintendent of tests, Portland Electric Power Company, chairman of the committee, recited excerpts from answers received to a questionnaire sent to member companies on the subject. The principal defects in certain types of breakers were found to be insufficient oil drains, oil leaks, faulty closing and tripping mechanism, and inaccessible parts. Suggestions for improvement were offered. Discussion later, led by C. W. Fick, General Electric Company, Portland, and C. E. Carey, Westinghouse Electric & Manufacturing Company, Seattle, brought out the fact that some of the defects mentioned occurred only in old-type breakers and had been eliminated in

the later types, and that the manufacturers were always ready to receive constructive criticism from the field for the purpose of obtaining data to be used as a basis for improving the apparatus offered to the user.

In a paper by R. Rader, assistant engineer, central district, Puget Sound Power & Light Company, Seattle, the subject of differential protection and neutral grounding of generators and transformers was discussed. The two principal advantages of grounding the generator neutral were noted to be the protection of the generator against high-voltage disturbances due to grounds and short circuits on the transmission system, and protection against internal faults, as phase-to-phase short circuit and the grounding of a winding. Reports from member companies disclosed that a number of different practices were in use.

Interesting from the commercial angle as well as the technical was the paper on "New Electrical Applications in the Paper Industry," by C. W. Fick, General Electric Company, Portland. Stating that the paper industry uses 71,000 hp. in Oregon and Washington alone, he explained the electric steam boiler, the Alexander dryer for drying the paper as it passes over cylinders, electric flow meters for measuring the steam and water used in different processes, revolving-frame synchronous motors on beaters, the double frequency, super-calender drive to give a one-tenth speed for threading the paper through the rolls, and the sectional drive maintaining uniform speed on all the sections of the paper machine. Mr. Fick's remarks were supplemented by C. R. Vicary, Washington Pulp & Paper Company, Port Angeles, Wash., and G. A. Frogner, Crown Willamette Paper Company, Portland, who told of experiences with the equipment mentioned, closing the first day's session.

The program of the Friday session opened with the address of Mr. Griffith, which is covered in another department of this issue, as is stated above.

Overhead Systems

First on the program of this committee was the reading by F. O. McMillan, associate professor of electrical engineering, Oregon Agricultural College, Corvallis, of the final report on the tests on 13-kv. to 17-kv. insulators as carried on in the laboratory of that institution (Journal of Electricity, Oct. 15, 1924, p. 302, and May 1, 1925, p. 338). Of the five manufacturers giving catalog ratings



Delegates to the third annual general meeting of the Technical Section, Northwest Electric Light and Power Association.

for dry flashover, three gave voltages lower than showed in the test, and two higher. The test showed results from 17.85 per cent higher to 5.8 per cent lower than the catalog ratings for dry flashover. Because of a breakdown of the high-voltage equipment, no tests on insulators above a normal rating of 17-kv. can be tested.

In the discussion H. H. Schofield told of the movement on foot to procure new high-voltage equipment for the laboratory of this college. He further outlined the purpose of the tests, begun in 1924 at the instigation of the committee, as being not so much to question the ratings given by manufacturers as to reach a common basis for giving specifications uniformly.

Practices in live-line maintenance work of the Idaho Power Company, Boise, were told in a paper by T. A. Purton, office engineer of that company, but read in his absence by F. J. Rankin, chief engineer. Changing insulators on a 66,000-volt line, which it is not practicable to kill, has been accomplished safely and successfully by the use of tools manufactured by the W. T. Safety Tool Company, Inc., Decatur, Ill. This maintenance has been considered only temporary, and it is the intention, at a time when the line may be killed, to make permanent the ties on the insulators changed. Discussion centered around the use and testing of rubber gloves for low-tension work, it being the consensus of opinion that gloves should be tested periodically.

The question of the life of treated and untreated poles, which has been assigned to this geographic division by the National Overhead Systems Committee, was next brought up for discussion by J. B. Brokaw, chief engineer, Eastern Oregon Light & Power Company, Baker, Ore., chairman, asking for an expression from members present as to the feasibility of undertaking this study. The ensuing statements disclosed that few companies have adequate records of old poles but many are now keeping a record of those recently set with the view to observing their performance. A motion introduced by S. C. Lindsey, engineer, central district, Puget Sound Power & Light Company, that the section go on record as favoring the keeping of an accurate record of the life of poles for future report, was passed.

Meters

"The Calibration of Meters and Instruments" was the subject of a paper by A. H. Kreul, foreman of meter department, Portland Electric Power Company, read in his absence by J. C. Henkle, superintendent of electrical maintenance and construction of that company, in which he discussed the standardization of instrument and meter practice, showing how all instruments could be kept in calibration. The need for this standardization was stressed by citing the case of two utilities distributing energy between each other, having occasion to compare their rotating standards and finding an error of two per cent between the two instruments with no record of a corrective error or calibration curve in either case.

L. D. Snow, general meter foreman, Puget Sound Power & Light Company, then discussed the selection of instru-

ment transformers for use with watt-hour meters, making a technical analysis, illustrated by charts, of the causes of discrepancies in the measurement of power through the use of current and potential transformers. The effects of opening the secondary circuit of current transformers, and of changing the burden on the secondary windings, were taken up from the standpoint of selecting the proper type of instruments for any given set of conditions.

The experience of this company with the use of the distant dial for securing a simultaneous demand on several scattered loads also was discussed by Mr. Snow, and a paper on this subject is to be written and included in the record of the proceedings of the meeting.

Underground Systems

Setting forth some of the difficulties encountered in operating underground equipment, J. M. Gillham, superintendent of underground department, Portland Electric Power Company, made suggestions for the improvement in secondary junction boxes, secondary oil switches, transformers, and oil fuses. He also suggested that more research work be done on underground problems and that the findings be published for the benefit of men engaged in this department of the business.

"Manhole Ventilation" was the subject of a paper by S. B. Clarke, superintendent of underground department, Northwestern Electric Company, in which he showed the deleterious effect of excessive heat on transformer and switch oil, cable insulation, and lead sheath, and explained how proper ventilation could be secured by natural or mechanical means. He explained how external factors, such as nearness to steam mains, had considerable bearing on the amount of heat that would be dissipated by radiation from the vault walls, and how increases in peak load or lengthening of the hours of the peak carried by the transformers in a vault might make necessary forced ventilation by fan.

Prime Movers

Stating that his committee was undertaking studies of particular interest to companies in this geographic division, C. C. Simral, assistant superintendent of steam plants, Portland Electric Power Company, chairman, first called on W. S. Hill, general superintendent, Grays Harbor Railway & Light Company, for his paper on "Equipment for Handling Hog Fuel." After referring to several different systems in use among Northwest companies, Mr. Hill described the high-pressure, long distance, pneumatic conveying system in operation in the plant of the Long Bell Lumber Company, Longview, Wash. Two separate systems, each consisting of fan and charger driven by a 500-hp. synchronous motor, and the necessary piping and dust collectors, convey the waste fuel from the mill through two pipes 2,600 ft. long to the fuel storage.

H. S. Bastian, manager, Charles C. Moore & Company, Portland, next explained by the use of blackboard drawings the merits and demerits of different types of grates and feeds for burning hog fuel.

"The Operation of Mechanical Soot

Blowers on Hog-Fuel Fired Boilers" was the subject of a paper by Tom Perry, superintendent of steam stations, Northwestern Electric Company, read in his absence by O. L. LeFever, in which was presented a cost analysis of the efficacy of blowing tubes by mechanical blowers. A questionnaire had been sent to paper mills, saw mills, and public-service companies of the Northwest using mechanical blowers, with the idea of determining what had been the success in saving fuel through their operation. The answers revealed a variety of opinion and a wide variation in results, but indications were that the blowers had not been a good investment.

The efficacy of different kinds of packing for centrifugal pump shafts and turbine control valve stems was discussed in a paper by W. C. McLagan, steam superintendent, Mountain States Power Company, Springfield, Ore., in which the conclusion was reached that all kinds have some defects, and that in the present stage of development no packing has yet been constructed that will give the service one would like to see.

The last paper on the program was on "The General Trend of Heat Balance Control in the Northwest," by R. S. Carroll, assistant engineer, Portland Electric Power Company. Describing the plant operation of one company which lately has worked out a dual-drive exciter set for controlling the heat balance, and stating that a second company is planning to use steam-driven auxiliaries with a new 20,000-kw. steam unit, he concluded that the general trend is toward the use of steam drive for auxiliaries for heat balance control. No time was left for discussion of the papers of this committee.

Resolutions were passed thanking the Puget Sound Power & Light Company for the arrangements made for the meeting, the Olympic Hotel for the use of its facilities, and the Seattle newspapers for the publicity given. The entertainment Thursday night included a banquet and theater party, while several trips to interesting places were arranged by the Puget Sound company. Entertainment also was provided for the visiting ladies.

Northwest Convention Dates Changed to June 14-17

The annual convention of the Northwest Electric Light and Power Association will be held in Spokane June 14-17 instead of June 16-19, as previously stated. The change has been made necessary by the fact that two other conventions scheduled for the same dates as the association's convention will bring to Spokane about 1,500 visitors with less than 500 rooms available in first and second-class hotels. In order to assure any accommodations at all, officials of the Northwest association deemed it necessary to set its convention date ahead.

Because accommodations will be at a premium, it is vitally important that members of the electrical industry outside of the Northwestern district who intend to attend the convention of the Northwest Electric Light and Power Association make hotel reservations immediately.

Pacific Coast Electrical Association

Transportation Section Studies Motor, Personnel Problems

Several papers on transportation problems in phases as widely separated as mechanics and personnel were read and discussed at the meeting of the Transportation Section, Pacific Coast Electrical Association, held in San Francisco, March 12-13.

Among the papers presented were: a questionnaire on selection of automotive equipment, by C. D. Weiss; Educational Methods, by W. M. Fairbanks; Automotive Records and Accounting Practice, by J. S. Moulton; Repair Shop Methods and Equipment, by V. W. Dennis; Lubrication, by E. C. Wood; and Electric Trucks, by W. E. Gallemore.

A committee, consisting of Messrs. Ducker, Fairbanks, and Mason was appointed by Chairman S. B. Shaw of the section to report at the next meeting at the convention in June on a classification of positions in member company shops, such as mechanics, drivers, chauffeurs, helpers, etc. This committee is to submit a definite outline also.

Mr. Weiss made a motion, subsequently carried, that the chairman appoint a representative from the section to go to the meeting of the truck operation subcommittee, Commercial Section, N. E. L. A., which is to meet in Boston June 28-29.

Messrs. Ducker, Fairbanks, and Weiss were appointed to a committee to prepare a program for the meeting of the section at the June convention. At this meeting four papers are to be presented, namely, Tires, Power Equipment and Labor-Saving Devices, Truck and Commercial Body Design, and Garage Design. The chairman suggested that members of the section co-operate with the electric truck committee of the Commercial Section, and that, if possible, the program committee endeavor to arrange the program at the convention to facilitate a joint meeting.

Schedule of Technical Conclave Meetings Announced

Details of the meetings of the technical conclave of the Pacific Coast Electrical Association, to be held in Fresno, Calif., April 7-9, have been announced by R. R. Cowles, chairman of the Technical Section, as follows:

Schedule of Meetings				
Committee	Wednesday April 7	Thursday April 8	Friday April 9	
Accident Prevention	10:00 a.m.	9:30 a.m.		
Electrical Apparatus		9:30 a.m.	9:30 a.m.	
Hydraulic Power	10:00 a.m.	9:30 a.m.		
Inductive Co-ordination		9:30 a.m.	9:30 a.m.	
Meters	10:00 a.m.	9:30 a.m.		
Overhead Systems	10:00 a.m.	9:30 a.m.		
Prime Movers	10:00 a.m.			
Safety Rules			9:30 a.m.	
Underground Systems			9:30 a.m.	
Joint Committee*	8:00 p.m.		2:00 p.m.	
Executive Committee	6:00 p.m.		6:00 p.m.	
Luncheon	12:05 p.m.	12:05 p.m.		
General Meeting		8:00 p.m.		
Social Evening and Dance.....			8:00 p.m.	

*Note: Joint Committees of Apparatus, Overhead, Safety Rules and Inductive Co-ordination on the subjects of "Grounding," "Transformer Standardization" and "Supervisory Control."

Headquarters: Hotel Fresno. Make reservations direct with the hotel, mentioning the Pacific Coast Electrical Association.

Meetings: San Joaquin Power Building.

Purpose of Meetings: Reports of delegates to Kansas City group meetings, transaction of regular business, reports of subcommittees, discussion and preparation of final reports.

Luncheons: The luncheon Wednesday will be a joint meeting with the American Society of Engineers. At the Thursday luncheon the committee chairmen and delegates will report on the Kansas City meetings, and Mr. Baurhyte will be the speaker.

Trips: Arrangements have been made for a trip on Saturday, April 10, to the Balch project of the San Joaquin Light & Power Corporation, now under way. If desired, a trip may be made to the Big Creek plants of the Southern California Edison Company, leaving Fresno on train Saturday morning at 8 o'clock, returning Sunday evening to Fresno, arriving 6:30 p. m.; or, as an alternative, automobile trips may be arranged to the Exchequer dam and power house of the Merced Irrigation District. The Sugar Pine mill may be visited during or after the conclave, and there are a number of substations of the San Joaquin Light & Power Corporation within easy reach of Fresno.

Mr. Cowles points out that these meetings will be the last held prior to the convention and urges that all members make an effort to attend.

P. C. E. A. Convention Committee Chairmen Appointed

The appointment of chairmen of committees that will have charge of the annual convention of the Pacific Coast Electrical Association, to be held in Los Angeles, June 8-11, at the Biltmore Hotel, has been announced by E. R. Northmore, general convention chairman. These appointments are:

Hotel—C. A. Kelley, Southern Sierras Power Company.

Reception—W. L. Frost, Southern California Edison Company.

Registration and attendance—E. H. Jones, Jones-Thorne Company.

Program—R. A. Hopkins, Westinghouse Electric & Manufacturing Company.

Local transportation—P. H. Ducker, Southern California Edison Company.

Steamship and railroad transportation—Harry L. Harper, Graybar Electric Company.

Entertainment—K. E. Van Kuran, Westinghouse Electric & Manufacturing Company.

Finance—O. L. Moore, Los Angeles Gas and Electric Corporation.

Electric Club Luncheon—S. E. Gates, General Electric Company.

Banquet—R. E. Smith, Southern California Edison Company.

Publicity—D. L. Scott, Los Angeles Gas and Electric Corporation.

Secretary of General Committee—William Haeckel, Los Angeles Gas and Electric Corporation.

The personnel of the various committees as yet has not been settled definitely.

Kansas City Meetings Outlined by Coast Delegates

Meter Committee

By R. G. Jones, Chairman Meter Committee, P. C. E. A.

Educational work seems to be paramount in all sections, and considerable discussion was devoted to this subject by the committee. This discussion brought out the fact that there is appreciable difference of opinion as to just what should be included in a proper training course for metermen. Some wish a broad scope of training while others advocate only such work as is necessary to produce a meter tester in the real sense of the term. It is evident that some thought must be given to the promulgation of proper training requirements for meter testers, metermen, and meter engineers, the three terms variously applied to men in that field.

Various problems relating to meter operation, and those causing disturbing conditions, were brought before the committee for discussion, information and advice. Many of these problems were of widespread interest.

Many new developments were submitted by manufacturers, eliciting a great deal of interest. Approval of certain of these that are to appear in the annual report of the committee was given. The matter of handling material of foreign manufacture brought out some lively arguments.

All reports being in, the editing committee was able to finish its work at this meeting. The committee adopted the general idea of reducing the volume of the annual report and fostering, instead, the liberal use of serial reports during the year. This procedure was recommended to all division chairmen.

The Kansas City Power & Light Company arranged for a very pleasant and instructive trip to all of its automatic substations. Relays of practically every known variety thus were witnessed in operating installations.

Electrical Apparatus Committee, N. E. L. A.—A 26-page serial report on Power Factor Improvement. The report is given under three classifications, power factor improvement as related to the entire system, power factor improvement on customers' premises, and a rather complete bibliography of the subject.



News of the Electragists



Full Report Inspectors' Meeting in Next Issue

A full report of the meeting of the California Association of Electrical Inspectors, held in San Diego, March 22-24, 1926, will be given in these columns in the April 15 issue, together with pictures taken during the meeting. Preliminary reports of the meeting, arriving too late for more extended notice in this issue, indicate that the program presented was of great value and that work of importance was accomplished in each of the three days' strenuous sessions.

Wattage Increases Reported by Southern Electragists

The merchandising section of the California Electragists, Southern Division, in order to establish a basis of effective business capacity is gathering from the membership of the division monthly reports on the wattage increase represented by the appliances sold that month. While these reports were at first slow in coming in, the secretary has reported that a 15 per cent increase in returned reports has been made.

The reports made for January would indicate that a total wattage of 226 kw. was sold in the appliances placed. A total of 74 of the special-campaign appliance was reported as the month's sales, representing 48 kw. This is an indication of the effectiveness of dealer merchandising in that section, taking into consideration also that the reports are as yet incomplete. Efforts are being made to get a 100 per cent report on the first of each month so that more complete summaries may be made of the results accomplished.

Roy W. Hamilton Electrical Store, 636 Market Street, Inglewood, Calif., is now under construction and upon completion will be stocked with a complete line of fixtures and appliances. Mr. Hamilton has been contracting in Inglewood for several years and now is building this store to take care of electrical fixtures and appliance sales.

Smith Electric Company, formerly at 15 Natoma Street, San Francisco, has moved to 975 Howard Street.

Pasadena Branch of Electragists Elects Officers—New officers of the Pasadena branch of the Southern Division of the California Electragists have been elected for the year as follows: president—J. B. Morgan; vice-president—C. A. Rowley, The McNally Company; secretary—H. W. Barnes, Barnes Brothers; treasurer—R. H. McCormick, McCormick Electric Shop. The branch has revised its system of levying dues and also has made provisions in its constitution whereby members automatically are dropped for unexcused absence from three consecutive meetings or for being in arrears in the payment of dues of thirty days standing.

The Crown Electric Company has opened a new fixture store at 6912 Melrose Avenue, Los Angeles. This is a branch of the factory and showroom at 5161 S. Vermont Street. The fixture stock is extremely high class, in keeping with the district in which the branch is located.



Philip S. George, manager commercial department, Coast Valleys Gas & Electric Company (left), and S. F. Butler, city electrician, both of Salinas, Calif. They are enthusiastic members of the California Association of Electrical Inspectors.

Santa Barbara Branch of California Electragists Established.—A branch of the Southern Division of the California Electragists has been established with eleven members as follows: Alamar Electric Company, John H. Gotchel; California Electric Company, Grant Campbell; Earl O. Tagg; Gutierrez Electric Company; Heumphreus-Smith Electric Company, Don Heumphreus; McGeary Electric Company, L. T. McGeary; E. W. Huston; H. L. Miller; E. Mollenkopf; Nielson-Smith Electric Company, Wylie Nielson; and Charles Wylie.

Coast Electrical Service Club Has Red Seal Meeting

The story of the Red Seal plan was presented to the members of the Coast Electrical Service Club at its second monthly meeting held at the Hotel Taylor, Paso Robles, Calif. G. M. Rankin of the California Electrical Bureau, Fresno, was the speaker of the evening. Co-operation between contractor-dealers and the power companies was the subject of a talk by M. P. Lohse of the San Joaquin Light & Power Corporation.

The meeting then was opened for a lively discussion in which the electrical contractors took an active part. The following officers were elected: President, Lee Wilcox, coast representative of the Valley Electrical Supply Company of Fresno; secretary-treasurer, W. R. Coats, Midland Counties Public Service Corporation, San Luis Obispo. Executive committee—Lee Wilcox; C. J. Kelly, Midland Counties Public Service Corporation, San Luis Obispo; J. J. Hutchins, Valley Electric Company, San Luis Obispo; W. F. Schmidt, Guarantee Electric Company, Paso Robles; and L. E. Smart, The Electric Shop, Santa Maria.

The club is composed of the contractors and dealers and the members of the power-company organization in the territory served by the Midland Counties Public Service Corporation.

The University Electric Company has been opened at 2866 University Avenue, San Diego, Calif., where a large fixture display has been installed. The firm members are: Layne W. Mitchell, formerly manager of the fixture department of the Southern Electric Company of San Diego; Robert Rayburn, formerly in charge of the fixture shop of the same company; and Harry Rees, formerly in the sales department of the San Pedro Electric Company, San Pedro.

Unger Electric Company has moved into new quarters at 1045 Mission Street, San Francisco. It was formerly at 1749 Hyde Street.

Woodhill-Patterson Company, Los Angeles, has changed its name to the Monitor Electrical Company, Inc. The address remains the same, 118 E. Third Street.



The smiles of the Hill Electric Company, Los Angeles. C. S. Hill (left) and his son, S. F. Hill. C. S. Hill has been active in the work of the Electrical Contractors' and Dealers' Association of Los Angeles as well as the California Electragists.

Meetings

Play Features Red Seal Home at Electric Club Meeting

Depicting in a humorous vein the terrors of the modern home when incompletely and improperly wired, a one-act play entitled, "Listen George," written by Richard E. Smith, advertising manager of the Southern California Edison Company, was presented at the Los Angeles Electric Club luncheon Monday, March 15.

This playlet was produced as a part of the campaign now being carried out by the Los Angeles Red Seal committee of the California Electrical Bureau to introduce and popularize the Red Seal plan of certified electrical contracting. Prominent realtors, architects, and builders were invited to be present at the presentation of the skit, and as a consequence more than 500 attended the luncheon.

The playlet portrayed the average man and wife developing the desire to build and own a home and brought out the obvious advantages to be gained by making it a Red Seal home, with all that that implies. The play was received enthusiastically and it was apparent that the Electric Club had selected an effective method by which to carry the story of the "Red Seal" to the allied arts and industries.

H. E. Sherman, Jr., vice-president and sales manager of the Illinois Electric Company, and chairman of the Los Angeles Red Seal committee of the California Electrical Bureau, acted as chairman of the day. Preliminary to the presentation of the play he read a resume of the history, purpose and expectations of the results to be derived from the Red Seal plan which served to introduce the general idea to the guests of the day.

The Los Angeles Gas & Electric Corporation orchestra supplied the musical numbers.

San Diego Electric Club Gives "What Price Light?"

In connection with the annual banquet and election of officers of the San Diego Electric Club, the play "What Price Light?" was given. This is the play which was circulated by the National Electric Light Association in conjunction with the industrial lighting campaign, and it was received enthusiastically by a capacity audience of dealers and contractors.



Cast of "What Price Light" as put on by the Electric Club of San Diego at its annual meeting.

The cast included the following: Roger Ruffin, easement engineer, San Diego Consolidated Gas & Electric Company; Walter Chapman and A. C. Petrich, new business department of the same company; and Ralph Chase, representative of the Westinghouse Electric & Manufacturing Company. Roger Ruffin as the gruff, "hard-boiled" factory superintendent, took his part in a most realistic way; Ralph Chase as the Quicklite representative, was the typical high pressure, put-your-name-on-the-dotted-line salesman, and Walter Chapman, as the "dumbbell" redheaded electrician proved himself a clever actor. A. C. Petrich capably played the part of a progressive salesman who knew how to sell correct lighting on scientific principles.

The consensus of opinion of those in attendance was that the story of good factory lighting could not have been presented in a more effective way.

COMING EVENTS

Technical Conclave, P.C.E.A.—

San Joaquin Power Building, Fresno, Calif.,
April 7-9, 1926.

Advertising Section, P.C.E.A.—

San Francisco, Calif.,
April 30, 1926.

National Electric Light Association—

Annual Convention—Atlantic City, N. J.
May 17-21, 1926.

Electrical Supply Jobbers' Association—

Annual Convention—Hot Springs, Va.
May 31-June 4, 1926

Pacific Coast Electrical Association—

Annual Convention—Biltmore Hotel, Los Angeles
June 8-11, 1926

Associated Manufacturers of Electrical Supplies—

Annual Convention—Hot Springs, Va.
June 7-12, 1926

Northwest Electric Light and Power Association—

Annual Convention—Spokane, Wash.
June 14-17, 1926

Northwest Electric Light and Power Association—

Annual convention—Spokane, Wash.
June 16-19, 1926.

Illuminating Engineers Present Store-Lighting Symposium

The San Francisco Bay Cities Chapter of the Illuminating Engineering Society inaugurated a unique method of studying practical illumination problems at one of its recent meetings.

Two of the members, unknown to each other, previously had been presented with a plan of a shoe store by the program committee and asked to submit their recommendations for a lighting layout at this meeting.

Each of the two members was allowed fifteen minutes to present his recommendations and discuss them. Although each layout was quite different, each provided an adequate lighting installation. Following this the floor was opened for discussion of the two plans by all of the members. Many interesting differences of opinion were brought out. The program was well received by the members, and similar symposiums covering various phases of illumination will be presented at future meetings.

Entire Office Building Used in Employees' Jollification

More than 4,200 employees of all departments of the Los Angeles Gas and Electric Corporation, their wives and children, were present at a huge New Year's reception and party held Jan. 8 in the company's main office building.

Headed by William Baurhyte, president, and Mrs. Baurhyte, and A. B. Day, vice-president and general manager, and Mrs. Day, all the company officials and department heads and their wives formed a receiving line which greeted all those in attendance.

Practically every floor of the building was utilized for some entertainment feature, and the whole structure was thrown open "from cellar to garret" for inspection.

Three orchestras, all made up entirely of company employees, furnished music for dancing on the seventh, eleventh and twelfth floors. Provisions were made also for those who desired to play cards. Many other forms of amusement and entertainment were also in evidence, the tenth floor being given over to the "Honky Tonk" amusement zone where thirteen different brands of fun were in operation. Refreshments of several kinds were served also.

Ample provision was made for the care of the children who attended the party. On the eighth floor a "Kiddy Korner" was prepared with competent attendants in charge, and entertainment and refreshments were provided for the youngsters.

Long Beach Electric Club Holds St. Patrick's Party

The annual St. Patrick's party of the Electric Club, Long Beach, Calif., was held Tuesday evening, March 16, with over one hundred members and guests in attendance. The affair, in the form of a dinner dance, was held at the Ebell Club.

Green and white decorations were employed in the banquet room and the same color scheme served for the table ornaments. A miniature stove-pipe hat and small clay pipe were presented to each of the guests. Irish melodies were played by Miss Grace Gogerty, harpist, during the course of the dinner. She also led the gathering in community singing.

The speech of welcome was delivered by Robert Abright, president, while short addresses were made by Dr. Edward Bailey, the first president of the club, and Joseph Lane. J. C. Kyle was chairman of the entertainment committee.

Electric Club of San Diego Names New President

At a special meeting of the Electric Club of San Diego, Calif., on March 16 Ray C. Cavell, superintendent of the record department, San Diego Consolidated Gas & Electric Company, was named president following the resignation of C. C. Clardy who, due to pressure of personal business, found it necessary to give up his post as president of the club.

The other officers of the club are: Vice-president—C. A. Stevens; secretary-treasurer—Percy H. Adams.

Personals

E. O. Shreve, who has been San Francisco district manager of the General Electric Company since 1917, has been appointed manager of the industrial department of the company



E. O. SHREVE

with headquarters in Schenectady, succeeding the late A. R. Brush. Mr. Shreve was born in Mapleton, Iowa, Oct. 31, 1881. Following a common school education, he found his first employment as a Western Union messenger for the Chicago, Milwaukee & St. Paul Railroad at the princely salary of \$8 a month. After studying telegraphy he became station agent for that railroad at Harrisburg, S. D., and later was night operator at Charter Oak, Iowa. He left that work to enter the Iowa State College at Ames, from which he was graduated in 1904 with the degree of B. S. in electrical engineering. He then entered the employ of the General Electric Company as a student engineer in test. After completing his student course, he entered the supply department in 1905, and a year later was sent to San Francisco as a supply salesman, covering all of the San Francisco outside territory. Afterward he was given the responsibility of the Nevada territory on all lines of equipment and supplies, with headquarters at Reno. About 1909 he was transferred to the San Francisco office as turbine specialist, and the following year he became apparatus salesman. In 1912 he was made manager of the industrial department, and in 1916 was promoted to the position of assistant manager of the San Francisco office. The next year he became manager, succeeding the late Tracy E. Bibbins, who was transferred to the Pacific States Electric Company as president. Apart from his official duties, Mr. Shreve has been keenly interested in the welfare of the industry as a whole, and always has been in the forefront of any movement that contributed to its welfare. He is a past president of the San Francisco Electrical Development League, has served on the executive committee, Public Relations and Commercial Sections of the Pacific Coast Electrical Association. He was

one of the founders of the California Electrical Bureau and has served on the advisory, finance and other committees. He was general convention chairman of the P. C. E. A. meeting in San Francisco in 1923, and was a member of the general convention committee and chairman of the finance committee for the N. E. L. A. convention in 1925. He is now chairman of the finance subcommittee of the Committee on the Relation of Electricity to Agriculture. Mr. Shreve is a member of the American Institute of Electrical Engineers and of the American Society of Mechanical Engineers and belongs to the Pacific Union, Engineers, Commonwealth, Claremont Country and Mt. Diablo Country Clubs.

Robert Prince, formerly in the warehouse of the Graybar Electric Company at Emeryville, Calif., has been transferred to the sales department of the company's Oakland branch.

H. G. Gross, president, American Ironing Machine Company, Chicago, was a visitor in San Francisco a short while ago. Mr. Gross has been making an intensive study of the ironing-machine market in the West, visiting the leading distributing centers both in the Northwest and California.

H. T. Plumb, engineer of the General Electric Company, Salt Lake City, recently delivered an illustrated lecture on "Fundamentals of Illumination" before the members of the Utah Society of Engineers.

W. W. Briggs, vice-president and general manager, Grays Harbor Railway & Light Company, Aberdeen, Wash., discussed "Pleasure in Business" before a meeting of the Chamber of commerce of Montesano, Wash., not long ago.

J. C. Gaylord, of the engineering department, Southern California Edison Company, Los Angeles, recently visited San Francisco on his return from the meetings of the Technical National Section, N.E.L.A., in Kansas City.

E. S. Carpenter, formerly Pacific Coast manager of the Aluminum Company of America, has become affiliated with the appliance sales department of the Graybar Electric Company in San Francisco.

A. S. Price, formerly assistant power engineer, Southern California Edison Company, has been transferred to the protection engineering department of the company as assistant protection engineer under the supervision of E. R. Stanfacher. Mr. Price has been connected with the Edison company in various departments for a number of years.

G. H. Whitney, who has been connected with the protection department of the Southern California Edison Company for some time, has been made supervisor of protective equipment for the company's northern division, and C. H. Hagey has been given a similar position with reference to the central and eastern divisions. Mr. Hagey has been associated with the Edison company for over twenty years. Both men conduct a field supervision of all the equipment under the jurisdiction of the protection department.

Chester Turlay, Vancouver, Wash., manager for the Portland Electric Power Company, has been elected a member of the board of trustees of the Federated Industries of Washington.

Miles W. Birkett, vice-president and general manager, The Washington Water Power Company, Spokane, returned recently from a five-weeks trip through California.

R. B. Childs, of the commercial department, and Richard McKay, of the engineering department, The Washington Water Power Company, Spokane, spent two days in Butte, Mont., a short while ago with officials of the Montana Power Company discussing problems relative to the interconnection.

T. H. Jordan, assistant district manager, the Hurley Machine Company, Seattle, spent a few days in Spokane not long ago.

Markham Cheever, formerly chief engineer and general superintendent of the Utah Power & Light Company, Salt Lake City, has accepted an appointment on the staff of the Electric Bond & Share Company of New York. For the past fourteen years Mr. Cheever has been associated with the Utah Power & Light Company as chief engineer. He took up the additional duties of general superintendent in 1918. Mr. Cheever was born in Ann Arbor, Mich., and was graduated from the University of Michigan in 1903. Immediately after his graduation he became assistant engineer with the Ontario Power Company during the construction of the first section of the power development plans of Niagara Falls. From this company he went to Colorado and accepted a position as engineer in charge of the construction of a hydroelectric plant at Ames, Colo. From 1908 to 1912 he served with the Telluride Power Company as assistant chief engineer. When the Utah Power & Light Company was formed in 1912 by the consolidation of a number of existing companies, Mr. Cheever was made chief engineer. Under his direction the great Bear River system, now operated by the Utah Power & Light Company, which is noted throughout the country as a highly efficient system,



MARKHAM CHEEVER

embodying a tremendous water-storage development, absolute stream control and large generating stations, was created. Mr. Cheever has taken an active part in the affairs of the American Institute of Electrical Engineers, the American Society of Mechanical Engineers and the National Electric Light Association, having served as chairman of the hydraulic power committee of the Technical Section.

Edgar Kobak, since 1924 assistant vice-president of the McGraw-Hill Publishing Company, Inc., has been made a vice-president of that company, a director and a member of the executive committee. His new position makes Mr. Kobak head of the electrical unit, which includes the electrical journals published by the company, and general sales manager of all of its publications. In the latter capacity he will be responsible for the operation of the amended selling plan recently announced by the McGraw-Hill company. Mr. Kobak has made rapid progress in the publishing field. He entered the employ of the McGraw-Hill company as a subscription and field representative about ten years ago and in less than a year was appointed to the staff of Electrical World as assistant engineering editor. After two years in that position he spent two years in the Chicago territory as advertising salesman for the Journal of Electricity, Electrical Merchandising and Electrical World and one year in St. Louis. Then he was made promotion manager of Electrical World, with headquarters in New York, subsequently becoming business manager of that publication and of the Industrial Engineer and later assistant vice-president.

W. L. Fitzpatrick, since 1912 connected with the Tacoma Gas & Fuel Company, Tacoma, and allied companies, has been appointed general auditor of the Mountain States Power Company, of which the Tacoma Gas & Fuel Company is a subsidiary. Mr. Fitzpatrick was born in Marinette, Wis., in 1889. After completing high school in Marinette, he spent two years with the N. Ludington Lumber Company of that city. In June, 1912, he moved to Tacoma and the fall of that year found him in the employ of the Tacoma Gas & Fuel Company as inventory clerk. He soon was given charge of the storeroom and later transferred into the general bookkeeping department. In 1918 he was made



W. L. FITZPATRICK

assistant treasurer, and in 1922 treasurer and auditor of the Tacoma company, the Puget Sound Gas Company, Everett, Wash., and the Olympia Gas Company, Olympia, Wash., a position he held until his recent promotion. His present position gives him jurisdiction over the accounting departments of all divisions of the Mountain States company in Washington, Oregon, Idaho, Montana and Wyoming.

J. O. Presbrey, of the Ivanhoe Division of The Miller Company, Cleveland, was in San Francisco recently en route to Arizona.

E. M. Herr, president, Westinghouse Electric & Manufacturing Company, recently visited the Pacific Coast during a nation-wide tour. While in San Francisco he was the guest of honor and principal speaker at a meeting of the San Francisco Electrical Development League.

R. C. W. Libby, who has been representing Landers, Frary & Clark, New Britain, Conn., in the Inter-mountain territory, has resigned and gone East to join the sales staff of H. G. Weeks Manufacturing Company, Hamilton, Ohio.

M. Luckiesh, director of the laboratory of applied science at Nela Park for the National Lamp Works of the General Electric Company, took a prominent part in the course in lighting instruction recently given by the Public Service Company of Colorado, Denver, to its commercial employees.

Z. T. Pettit, of the Los Angeles Gas and Electric Corporation, has been promoted to the position of underground electrical engineer, filling the vacancy caused by the death of O. C. Miller. Mr. Pettit entered the service of the corporation Sept. 20, 1905, as a lineman, and served in various capacities until Jan. 1, 1924, when he was made foreman, a position which he has relinquished to assume his present one.

R. G. Gentry, manager public relations department, Public Service Company of Colorado, Denver, not long ago completed the twenty-fifth year of his service with that company.

J. C. Douglas, formerly connected with the Edison Electric Appliance Company, San Francisco, has resigned to become manager of sales promotion for the Johnston-Ayres Company of that city.

C. B. Huston, formerly associated with the Wholesale Electric Company, San Francisco, has entered the service of the Dictograph Products Corporation, New York, with offices in the Monadnock Building, San Francisco. He will specialize on intercommunicating telephone systems.

Frank J. Kiefer, formerly plant superintendent, White Pine Products Company, Alameda, Calif., has joined the staff of the California Electrical Bureau with which he was at one time connected.

Harvey E. Brundage, of the Cline Electric Manufacturing Company, San Francisco, was in Spokane a short time ago.

Carl L. Hoffman, of the commercial department of The Washington Water Power Company, Spokane, has been placed in charge of the sales of heavy-duty cooking equipment.

Dr. C. A. Sawyer, of Evanston, Wyo., has been elected a director of the Utah Power & Light Company to succeed General Bulkeley Wells, of Telluride, Colo., who is also president of the Western Colorado Power Company. Dr. Sawyer is a director of the Evanston National Bank and is also superintendent of the Wyoming state mental hospital at Evanston.

W. F. Raber, vice-president and general manager, San Diego Consolidated Gas & Electric Company, recently returned from a short trip to Los Angeles.

Frank Schram, manager, Southwestern Public Service Company, Roswell, N. M., is the new president of the New Mexico Utilities Association, having been elected to that office at the recent annual convention of the organization in Albuquerque. Mr. Schram has been identified with the public-utility business of New Mexico for the past ten years, having served with the several predecessor companies of the present Southwestern Public Service Company. He plays an active part in the affairs of the electrical



FRANK SCHRAM

industry in that section of the country, and was the pioneer in public-relations work in New Mexico. At the present time he is a member of the Rocky Mountain Committee on Public Utility Information. Mr. Schram also finds time for interests outside of the electrical field, one of them being the Advertising Club of Roswell, of which he is president.

R. W. Murphy, Pacific Coast manager, Westinghouse Lamp Company, San Francisco, recently left on an Eastern trip in the interests of his company.

Obituary

Richard H. Stretch, who under the title of county surveyor had charge of city engineering for San Francisco in 1872 and 1873, died in Seattle March 22.

Charles C. Gray, general sales manager, the Detroit Insulated Wire Company, Detroit, died in that city March 16. Mr. Gray for many years was connected with the Westinghouse Electric & Manufacturing Company at East Pittsburgh.

Thomas G. Whaling, vice-president of the Westinghouse Lamp Company, died suddenly in New York City March 1. Mr. Whaling joined the Westinghouse Lamp Company in 1906 as assistant to the manager, and held the successive positions of sales manager, assistant general manager, general manager and vice-president. He was widely known in the electrical industry as one of the pioneers and early leaders in the lamp industry.

TRADE NOTES

Apex Electrical Distributing Company has discontinued its Denver office. Hereafter a local service agency only will be maintained by Robert G. Park. H. P. Whitten, division manager, has been transferred to Seattle, where he will assume management of the Electrical Utilities Company, which operates a chain of retail Apex-Rotarex stores in the Northwest.

Curtis Lighting, Inc., Chicago, has announced a change in its Southwestern territory. F. H. Simmer, formerly resident engineer in the Indiana territory, has been transferred to the Southwestern and now represents Curtis Lighting, Inc. in the states of Texas and Oklahoma, with headquarters in the Republic Bank Building, Dallas, Texas. He succeeds G. K. Clement in that territory.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, recently has completed a new line of industrial panelboards for the control of lighting systems in offices and factories. These panelboards are made in sizes supplying from 4 to 32 circuits and in capacities ranging from 30 to 100 amp. The Westinghouse circular DMF M-314 describes these panelboards in detail and lists complete ratings and capacities.

The American Resistor Corporation, Philadelphia, has recently opened branch offices in Cleveland and San Francisco, making six in all, the others being located at New York, Philadelphia, Los Angeles and Milwaukee.

The Eaton Electric Furnace Company of Taunton, Mass., has issued a bulletin entitled "Eaton Electric Furnaces," descriptive of the Globar cartridge-type heating elements for operating temperatures of 1,600 deg. to 2,350 deg. F.

Electro-Kold Corporation, Spokane, has issued a folder illustrating the complete Electro-Kold line of electric refrigeration. The various sizes and styles are shown and complete details given.

The Arrow Electric Company, Hartford, Conn., has issued a reciprocating heater-switch catalog. The book is well illustrated with drawings and photographs and contains a complete price list.

Trico Fuse Manufacturing Company, Milwaukee, has made many changes in its plant. The electrical testing laboratory has been enlarged and rebuilt with the latest and best equipment. The offices also have been enlarged, new lighting equipment has been installed in the factory, and production facilities considerably increased.

Foxboro Company, Inc., Foxboro Mass., has moved its Chicago office to 204-206 St. Clair Building, 154 East Erie Street.

Electrical Testing Laboratories, New York, has issued a new bulletin, No. 101, entitled "Testing, Inspection, and Research Work," on impregnated paper-insulated lead-covered cable. The book is well illustrated with photographs.

The General Electric Company, Schenectady, N. Y., recently issued a publication bearing the designation GEA-306, a twelve-page illustrated bulletin devoted to the electrified first line battleships and airplane carriers in the United States Navy.

The Hisey-Wolf Machine Company, Cincinnati, has issued a small pocket catalog describing the new Hisey double-slide angle plate grinder. The catalog is illustrated with photographs and drawings and contains complete tables of the types, volts, capacity and weight.

Burndy Engineering Company, Inc., New York, has issued a catalog descriptive of the Burndy T-connectors for tubing cables and solid buses. Complete descriptions and price lists are given.

The Louis Allis Company, Milwaukee, Wis., has developed a new direct-current motor, known as type N. A., which is described fully in engineering bulletin No. 226 now available for distribution.

Grant Gear Works, Inc., South Boston, has issued recently a complete 100-page catalog and price list of iron cut gears, brass cut gears, cast gears and gear wheels.

The Armstrong Manufacturing Company, Huntington, W. Va., is featuring its latest development in an automatic electric range in literature just issued. The concern also is issuing small booklets of tested recipes suitable for its table stove.

The Robbins & Myers Company, Springfield, Ohio, recently has developed a new type of 36-in. alternating-current ceiling fan as illustrated and described in its booklet.

Walker & Pratt Manufacturing Company, Boston, recently has placed in the Western market its new Crawford electric ranges 18-92 and 16-82. The 18-92 range is equipped with four surface elements, two of 1,500-watt and two of 1,000-watt capacity. The oven is 18x18 in. with a height of 15 in. and the interior is enameled in blue. Two 1,500-watt elements are installed in the oven. This model comes in full white enamel or in black Japan with white enamel oven door and splashers. The 16-82 range is slightly smaller, having only three surface elements, two of 1,500-watt and one of 1,000-watt capacity. The oven is 16x17x14 in. and has two 1,500-watt elements installed. It is lined with blue enameled metal. This model is furnished only in black Japan with white enamel oven door and splashers. The two new models may be had with or without Crawford temperature control or Crawford temperature and time control. These ranges are furnished with either right or left-hand ovens. Graybar Electric Company is distributing the Crawford ranges in the western territory.

Eureka Tool & Machine Company, Newark, N. J., has issued recently literature describing the Eureka time switch, which automatically switches lights on or off at any desired time. The company also is featuring a new toaster to retail at \$2.95.

Wagner Electric Corporation, St. Louis, has developed a lower priced three-speed 10-in. oscillating fan that will retail at \$16.50. It is powered with a well-insulated, well-ventilated Wagner induction motor, cool and quiet in operation, having no brushes or commutator to wear out. The fan can be used either for desk or wall mounting.

Crouse-Hinds Company, Syracuse, N. Y., has issued bulletin No. 2084, which describes and illustrates its flexible fixture hangers. Complete price lists are given.



"Omy, omy," thinks Arthur Prager, manager of the Albuquerque Gas & Electric Company, Albuquerque, N. M., and host to the recent convention of the New Mexico Utilities Association. "Omy, omy, what a golf rig that would be!" The Jemez Pueblo Indian chief, who is reading a paper on inductive interference or something equally esoteric, doesn't realize that he is causing his guests at the reservation so much sartorial envy. Next year's golf togs may well be in Pueblo blanket styles, if Lucille or whoever sets the styles can only get the Indian sign on them.

Journal of Electricity

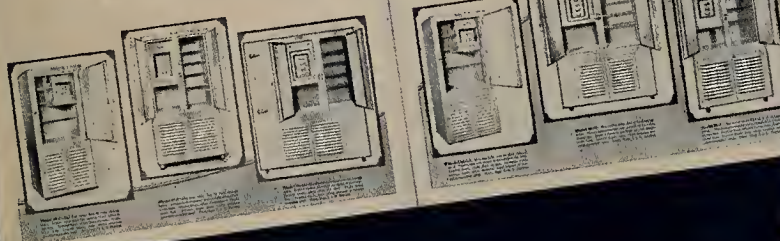
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IN THE ELEVEN WESTERN STATES

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"Glad I Had It Sent Home"

IN conversation with one of the editors of the Journal of Electricity, an executive of a power company made the following significant statement:

"I'm glad that I asked your magazine to have my copy of the Journal sent to my home instead of to the office. It has proved to be one of the wisest of decisions, for now I find that I can pick it up in the evening and devote much more time to a careful reading of its contents. Consequently I am getting more out of it than I ever did before when it came to the office to compete with all the affairs of a busy day for a moment's attention."

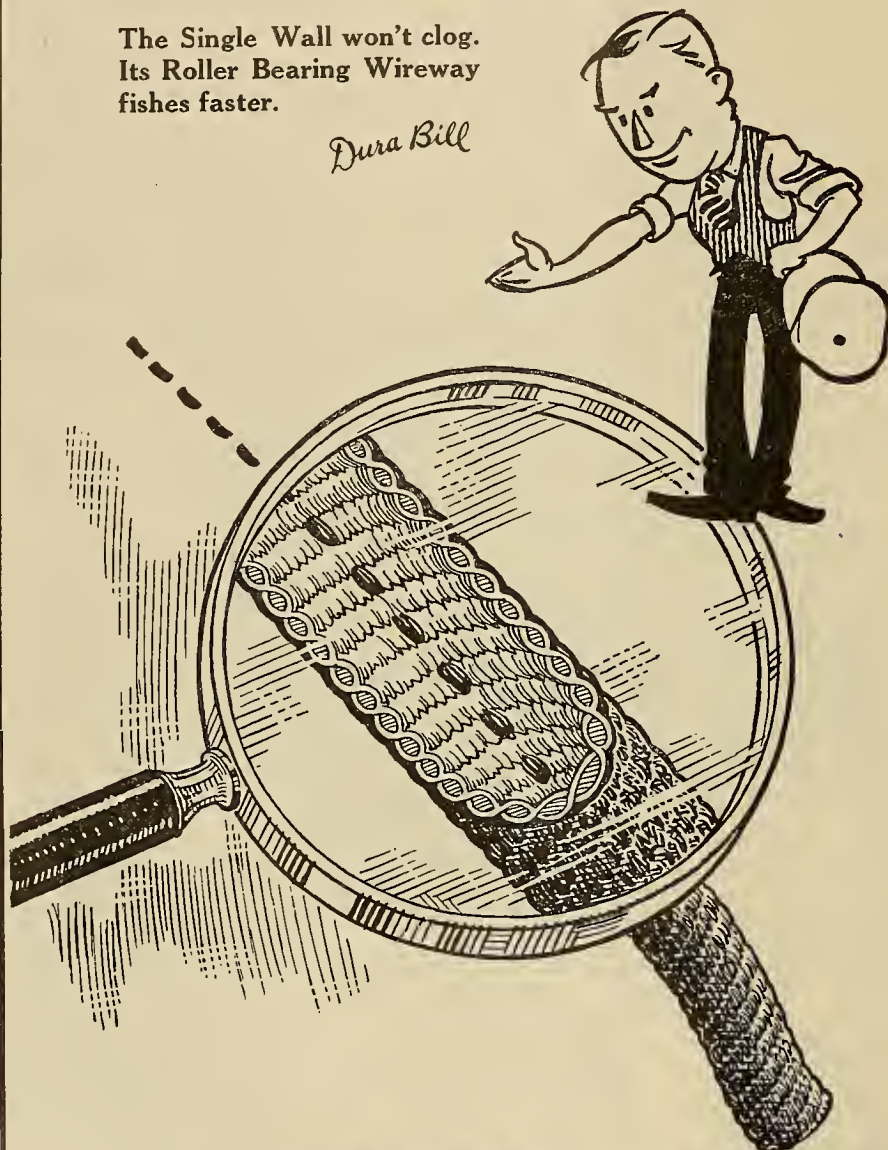
There is in this man's experience a meed of good advice to others who receive the Journal. Taken home and read there at leisure, neither crowded nor interrupted by the affairs of the moment, any reader may assure himself of a well balanced ration of information concerning his business in all of its ramifications. A trained editorial staff arranges for each issue the finest product of thought upon the problems and methods of the day. Correspondents in all fields supply accurate information regarding late development works. Editorials digesting the passing phases of a fast-growing industry are to be found in each copy. These deserve a careful study and a thoughtful perusal.

Moreover, such a leisurely reading will repay one deeply. To anyone engaged in the electrical industry the richer knowledge of its constantly changing panorama which careful reading of the Journal provides will serve to keep that reader abreast of development, of current thought and of improved method. Each of these will be reflected in whatever activity the careful reader participates in and result in his better preparation for the tasks and the rewards of tomorrow.

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EDITORIAL

Domestic Refrigeration—

A Big Selling Job

BECAUSE the attention of the entire electrical industry is centered upon electrical refrigeration, considerable space in this issue has been devoted to that subject. Working on the premise that central stations already are sold on the advantages of domestic refrigeration from a load-building standpoint, most of the material is of a sales character dealing with both proved and projected selling campaigns.

However, for the benefit of those executives who are not familiar with the desirabilities of the domestic-refrigeration load a few remarks on this subject have been included as not being entirely amiss. Electric refrigeration is doubly desirable because it combines a good load factor with a high earning capacity. Although rated at 250 watts only, a single refrigerator will show a load factor of from 35 to 45 per cent and groups of machines will average 60 to 70 per cent. A refrigerator will return between \$3 and \$5 per month, depending upon the rate it earns. In terms of other appliances its annual return in revenue will equal 32 washing machines, 50 fans or 11 irons. The annual revenue for each kilowatt of demand for the refrigerator will equal the annual revenue for each kilowatt of demand for 4 electric ranges, 53 waffle irons or 36 toasters. Coupled with this is the fact that it can be served without any investment in new equipment. Seemingly this would clinch its case with the central station.

With these facts in mind, the job then is one of selling. It is conceded that, aside from the comparatively well-to-do, who are immediate prospects, the primary selling job is one of educating the public to the necessity of refrigeration itself. After this, mention can be made of the advantages of electric refrigeration and the real selling campaign launched. Commercial men can gain much from the discussions on other pages of this issue regarding selling plans of some of the companies who have undertaken and who are undertaking the sale of domestic electric refrigerators. Nor is the contractor-dealer overlooked. One writer, in relating the experience of his firm, proves conclusively that electric refrigeration is a promising field for profit for the contractor-dealer.

Our readers are commended to a careful study of the material in this issue. One does not need to be a prophet to say that electric refrigeration is no longer an idle dream. It is an accomplished fact. Those who are among the first to put their

shoulders to the wheel will be the ones who will profit most from the development of this new field.

Denver Threatened with Municipal Ownership

DENVER, chief city of the Mountain empire, finds itself in the throes of a problem concerning its electrical future. The expiration of the public-utility company's franchises in May have been made the opportune basis for one of the most peculiar and subtle political contests in modern time. If it were merely the municipality versus the utility company—the usual line-up—the people of Denver might think the problem mere child's play, but Denver's is not so simple a question.

The utility company's franchise expires in May. It aspires to renew this franchise on the basis of having given the public good service and fair rates. There is no decided complaint against the company, and under ordinary circumstances the renewal of the franchise would be granted as a matter of course, as it should be, considering the investment of the company in the community, its past record, and its policies.

But the granting of a franchise sometimes has been made a political "sword of Damocles," threateningly held over the head of the utility. Denver politicians have seen fit so to play with their present power over the utility virtually at their mercy. To this end a valuation of the company's property is to be made, experts having been retained by both the city and company for these proceedings. And even the Chamber of Commerce has wanted to put a finger in the pie by appointing its expert to investigate and "protect the rights of Denver business men."

As if this were not enough, an entirely extraneous influence is thrown in at this breach to hold out luringly to the city administration a possible hydroelectric program on its water system for which all the rosy promises of any municipal scheme of course are made. This intrusion is made by a group of engineers, lawyers, and financiers anxious to build the system on what was known in the army as "jawbone," to be paid for out of "profits," and to cost nothing if not successful. It is as pretty a "30-day trial offer" with the usual "no obligations to purchase" as ever came out of a mail order brochure.

The very enticing nature of this "free—pays for itself out of the profits it makes" offer and its

evident favor with a gullible public has thrown into an already muddy stream more to darken it. The scheme for hydroelectric development proposes to develop the South Platte River and is predicated on this stream being able to provide the city with adequate water for its domestic uses, which it has not yet done. By concentration of water development on this one stream, however, the dependence upon the famous Moffat tunnel would be removed, and the district which is responsible for the Moffat faces the possibility of having to bear all the cost of this project without the help of a Denver water-supply project, which was very important as a consideration in the beginning of the development. This threatened "double-crossing" of the Moffat project for the new love, a municipal hydro plant, has been said to underlie the resignations of members of the city water board.

What is this whole situation, anyway? A free-for-all? Are vital services to a community something which everyone can take a hand at regardless, or are they specialized services of men who have devoted their lives to their study? The promoters of this hydroelectric scheme have the effrontery to suggest that the city build these plants, sell their output to the public-service company to distribute, and pay for them thus at the expense of the company's investment in steam plants. In this way the cost of the project would be absorbed presumably by the time the renewed franchise of the company should run out, in twenty years from now, and the company would have "good-fellowed" itself out of existence.

Are legitimate investments of millions in the present power plants and distributing systems to serve Denver to be so lightly considered by an ambitious administration? The utility company for years has investigated all possible hydro sites and decided that steam power would be more economical. The question casts a shadow upon the good faith of public institutions. Is the Moffat tunnel to be abandoned by the city largely responsible for its inception because some other tempting tidbit presents itself? Is the city of Denver to become another victim to a "mail order" stunt of financing and engineering? The idea seems to hint danger from its very blandness and "big-heartedness." These are questions which Denver faces and must answer. What that answer will be only a test of the public's fairness or gullibility will prove.

B.C. Electric Proves Soundness of Customer-Ownership Idea

WITH more than ten years' successful experience with the customer-ownership idea in the United States, utilities have reached the point where record stock-selling campaigns cause hardly more than a ripple on the surface of the industry. One Pacific Coast utility, the British Columbia Electric Railway Company, has established such a remarkable record during the past month that the

industry has cause to pause and consider and even profit from the experience of this Canadian company.

As set forth elsewhere in this issue, the British Columbia company, with a population of only 350,000 to draw upon, received applications for more than \$7,000,000 of shares of prior preference stock in five and one-half days. Among the many outstanding features of the campaign were the following: Only \$2,250,000 was included in the initial offering, and the entire issue authorized was but \$5,000,000. Applications were limited to fifty shares and only residents of British Columbia were allowed to participate. Employees of the company brought in applications from 10,851 people for \$5,625,350. Only \$1,500,000 was marketed through bond dealers. Forty-seven per cent of the employees applied for stock. So spontaneous was the public reception of the campaign that much of the newspaper and other advertising was not used because the issue was oversubscribed so soon.

There are many factors which have a definite bearing upon the success of the company's initial customer-ownership effort. In the first place there appears to have been a large volume of liquid assets in the savings banks of the province belonging to people of comparatively small means. These people never had been in the habit of investing and never were inside a broker's office. This is indicated by the fact that of 10,000 applications received more than 3,000 were for a single share of stock.

Then it is impossible to overlook the high standing of the company itself. It practically dominates the territory insofar as electric, gas and street railway service is concerned. With the exception of the Canadian Pacific Railway, there is no company with such large interests in the territory. Moreover, the company has been consistently building up good-will for ten years both through service and publicity. For several months before the campaign the public mind was prepared to regard the public utility as an essential industry and one of the soundest fields for investment through newspaper and other publicity.

Every advantage was taken of the 3,000 employees and the many company offices to make investment on the part of the public as easy as possible. Finally those in charge of the campaign tackled it with the realization that it would be a hard job and no stone was left unturned to assure its success.

The British Columbia Electric Railway Company deserves the congratulations of the industry of the entire continent for the splendid showing it has made. Its success in this initial campaign justifies all that has been written and spoken regarding customer-ownership. The remarkable record achieved indicates public confidence in the integrity of the company—a fact which is borne out also by the fact that Vancouver is one city where there is practically no sentiment in favor of municipal ownership.

DISCUSSION

Engineer Explains Stand Regarding Hetch Hetchy Power Cost

To the Editor:

Sir—It is to be regretted that City Engineer O'Shaughnessy has made a controversial matter of certain facts relating to the Hetch Hetchy power and water-supply project. San Francisco has entered upon an unwise program and cannot turn back. The city must now make the best of the present situation. It is immaterial whether this situation, making for high cost of power and water, and for a long deferred completion of the water-supply project, is due to the terms of the Raker Act or to other causes. The question now is what is or what will be the relative investment in the power plant and in the water works. To this question my comments* were directed and in settling this question something more is needed than a resolution of the Board of Supervisors. The city engineer tells us that for the present \$21,000,000 should be considered as the capital expended for power. The supervisors appear to want this amount materially reduced. The figures relating to cost to some recent date now presented by the city engineer** throw but little light on what should control the apportionment of cost to power development and to the water works. They do not, for example, include, as they should, interest during construction.

I am not commenting at this time on the merits of the arrangements with the Spring Valley Water Company, and need only say that my understanding with reference to the Calaveras pipe line has been that in return for the consent of the water company to use this pipe the city is making some sacrifice in interest on its cost and is assuming the entire item of pipe depreciation. My reference to this feature of the city's project was prompted by the fact that if the city had adhered to its original water-supply project under progressive development, the pipe long ago would have come into use for Tuolumne River water. The question is not that suggested by the city engineer as to the fairness of the conditions of the lease to the water company, but as to what part of the cost of installation of the pipe at this time and its operation until needed for Tuolumne River water is chargeable to power. The city may take all the comfort which the high type of construction aimed at by the city administration, justifies, but the fact remains that both power and water from the Hetch Hetchy system will be unusually expensive. As a guide for its further

activities in the public-utility line, the city may well consider whether it would not have been better at each step toward a realization of a water-supply project to have given as much thought to the wisest policy to be followed as to the project's engineering features.

I would prefer to stop here but some of Mr. O'Shaughnessy's statements will be misunderstood if not explained. Thus, for example, he says that the \$45,000,000 original bond issue covered a water-supply project for 60,000,000 gallons per day. He does not state that the 60,000,000 gallons was the first unit of an ultimate larger development nor that this cost estimate is not comparable with the cost of delivering Tuolumne River water into the Crystal Springs reservoir as proposed under the present project, because the original bond issue included \$12,000,000 for a city distribution system and it did not include the cost of a power project. He further says that the city was ordered to show cause why the Garfield permit (of 1908) should not be revoked. The order was to show cause why this permit insofar as it related to the use of the Hetch Hetchy Valley as a storage reservoir should not be revoked. The issuance of the permit was preceded by my own investigations, as city engineer, 1901 to 1903, which led to the selection by me of the Tuolumne River as the most available source of mountain water for San Francisco. The review of the situation by the Board of Army Engineers some years later and their confirmation of my conclusion was of course a source of gratification to myself. This does not mean that I now nor at any time in the past have ever approved of the deplorable Raker Act, the terms of which should never have been agreed to by San Francisco.

The amount which Mr. O'Shaughnessy reports as having been expended to some recent date may of course be accepted as correct, but the comparison which he makes of this \$43,550,000 with the figure which I have named as approximating the city's present day investment is misleading. He overlooks the unpaid obligations and actual expenditures on construction since the date to which his financial statement applies and he also forgets that about \$10,000,000 raised by taxation and paid during the last ten years as interest on bond issues represents capital investment. When these amounts are added to his \$43,550,000 the aggregate will be large enough to justify my assumption, made without examination of the books, that about \$60,000,000 are now invested in the project. An examination of the records may, of course, show that the actual investment, with proper allowance for any money returned to the city treasury out of earnings, is nearer \$55,000,000 than \$60,000,000, named as approximate, but this will not alter the situation to which I have called attention.

C. E. GRUNSKY.

San Francisco, Calif.
March 29, 1926

*Published in letter form in Journal of Electricity March 15, 1926, page 208.

**Published in the Journal of Electricity, April 1, 1926, page 246.



LAKE CHELAN, Washington, seen in the upper part of this photograph, is soon to serve as a storage basin for a new 50,000-hp. plant to be erected on the Columbia River, in the foreground, by The Washington Water Power Company.

Trial Plan Works Effectively

By R. B. McElroy

Assistant Sales Manager, The Washington Water Power Company, Spokane, Wash.

WHEN The Washington Water Power Company decided to consider the matter of selling electric refrigerators, and that was in 1923, it had no precedent to look to for the establishment of its policies and plan except those policies which pertained to appliances of a similar load-building character, the electric range and water heater. Electric refrigeration, a domestic application, was something still untried. And yet, because it seemed a logical next step in home electrification, it was thought worthy of more than just casual consideration. Consequently all during the year 1923 this company investigated as best it could the various refrigerating plants on the market at that time.

After selecting a plant which met our requirements, the next step was to secure men and to train them in the factory itself to fit them for the task of selling electric refrigeration in the home.

As soon as the company was ready to announce its intentions, that it had selected a make of electric refrigerator for home use, several large display advertisements were carried in the newspapers, telling all our customers about the plant selected, electric refrigeration in general, and the company's willingness to have them consider with it the advantages of electric refrigeration.

With actual sales work ready to begin, our men made personal calls on such prospective purchasers it was known definitely were in financial position to install a plant if they could be shown its value. Our salesmen encountered from these prospects a skepticism as to the value of domestic refrigerators which proved to be a decided obstacle. Each prospect felt that he would be willing enough to purchase a plant if he could be assured that it would give satisfaction.

The obstacle being of such a nature, it was decided that the company should select 25

SINCE 1923 this company has been an active merchandiser of electric refrigerators. When it found that its first prospects were skeptical of domestic refrigerators it tried successfully the plan of placing them on trial in responsible homes. Not one was returned, and thus established the business has grown consistently.

prospects and should offer to install a plant in their homes without any charge to them, they to keep it for six months, at the end of which time, if in their judgment it was perfectly satisfactory, they could either pay for the plant in cash or on a monthly payment plan. In selecting these people care was exercised to place these plants with people who, at the end of the trial offer, would be in financial position to go through with the offer if they were satisfied with the machine.

Of these 25 people each one kept the plant after the trial offer, and all reported the plants as giving entire satisfaction. From these same people company salesmen since have secured many additional prospects, most of whom have been sold, and the others are still being called upon and are considered good prospects for an eventual sale.

Newspaper advertising dealt entirely and extensively with what refrigeration would do for the home, at no time knocking the ice man or ice as a refrigerant. It has been the company's attitude since the beginning that if it cannot sell domestic refrigeration on its merits and not at the expense of knocking some other industry, it cannot continue in this line of business.

In addition to the newspaper advertising, a selected list of 500 people was gathered. In this list were only people in such circumstances as to

be able to afford a refrigerating plant. At intervals of ten days a series of three letters on refrigeration was sent them, enclosing folders describing the particular plant the company handled. With the last letter a postcard was enclosed which the prospect might mail back to the company, allowing our salesman to call at the home in person and explain the proposition. This direct-by-mail advertising was very satisfactory.

Wherever an opportunity to display an electric refrigerator presents itself, as at a fair or community gathering of some sort, a display is

Customer's Letter Authorizing Placing of Refrigerator on Trial

.....Date.....
The Washington Water Power Co.,
Spokane, Washington.
Attention of Mr.(Salesman's Name)....
Gentlemen:

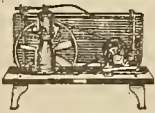
Confirming our conversation relative to the placing of a(Size)..... cubic foot Electro-Kold Refrigerating Plant in my residence located at(Address)....., beg to advise that you are authorized to make this installation at once.

It is my understanding that you are to install the refrigerating plant in my residence on trial until.....(Trial Period Date)..... after which time, if the plant has proved satisfactory to me, I will agree to pay you(\$.....)..... cash or(\$.....)..... on your term payment plan. However, if the plant has proved to be unsatisfactory, you are to remove same from my premises without any charge whatsoever to me.

Very truly yours,

Introducing Refrigeration Systems for Every Home

ELECTRO-KOLD



Electro-Kold Power Plant

This picture shows the little power plant and mechanism of "Electro-Kold" home refrigeration plants. Takes very little room and is generally placed in the basement. Requires but a small amount of electric power to operate it, as a thermostat automatically controls the temperature in your refrigerator—and also stops and starts the motor.

Make Dainty Ice Cubes for Table Use

Dainty ice cubes for cold drinks or table use are frozen in neat little trays from your pure drinking water. Salads, desserts, parfaits, mousses or other dishes can be frozen in these trays. Furthermore, one of the exclusive features of ELECTRO-KOLD is a compartment where meat or game may be placed and frozen, thus ensuring its perfect preservation.

For years delicatessen shops, butcher shops, restaurants and grocery stores have had refrigeration plants. Now comes the day of home refrigeration.

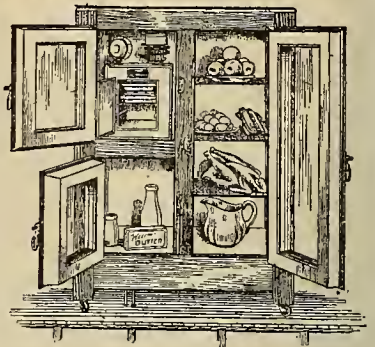
Electric appliance people have been working on the problem of home refrigeration for years. Many splendid systems have been evolved.

We have examined most of them and as a result have selected "Electro-Kold" as the one system that we can sell and recommend.

Electro-Kold has no frosted pipes—it can be installed in any good refrigerator—while the electric mechanism that operates it is placed in some small out-of-the-way place in your basement.

"Electro-Kold" equipment is not expensive—takes only a few hours to make installation.

"Electro-Kold" Home Refrigeration Systems Sold on Popular Monthly Payment Plan



Meet Our Expert on Home Refrigeration

MR. A. E. KNIGHT

There is such a big demand for home refrigeration—that it has been necessary for us to go into this business in a big way.

We have engaged the services of Mr. A. E. Knight as expert in this line.

Come in and meet him.

If you want a home interview just call Main 5171 and Mr. Knight will call at your home and explain all the wonderful advantages of this, the very newest in modern home equipment.

"Electro-Kold"
Home Refrigeration
Systems Are
Manufactured Right Here
in Spokane by
Electro-Kold
Corporation

"Kold Facts"

Takes only a few hours to install an Electro-Kold system in your home, sweet home.

Then you are assured of pure, healthful refrigeration at all times.

No drain pipes to clean, no drip pan to empty.

Electro-Kold maintains an even temperature always below food spoiling point, which allows you to keep edibles for weeks and months.

Can be installed in any good standard make refrigerator.

Cost of operation very small, as motor runs only when needed.

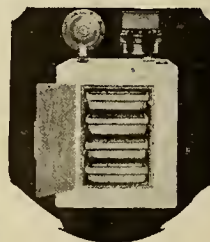
The Wa

Corner Trent and Lincoln.



Water

"Electro-Kold"—Made in S



Company

throughout the Inland Empire

ELECTRO-KOLD

Home Refrigeration Pl

Produce Uniformly
Cold, Dry, Crisp Air

Winter and summer, day in and day out, your refrigerator will always have the same temperature.

This is one of the features of "Electro-Kold" that home folks appreciate greatly.



"Electro-Kold" can be installed in any good refrigerator—there to give you perfect refrigeration at extremely small cost.

Sold on Convenient Terms of Payment

Make Your Own Ice for Table Use

A special compartment in the Electro-Kold will freeze dainty ice cubes for table use. Utilization of the same water you use for drinking and cooking insures the utmost purity.

In this compartment you can freeze cream, sherbets, mousses and other tasteful desserts at your pleasure with no additional expense.

The Washington
Water Power Co.

Corner Trent and Lincoln

Telephone Main 5171

Electricity now
furnishes you
Perfect
Refrigeration

Let Us Tell You About

ELECTRO-KOLD

is the new and modern system of home refrigeration being adopted by so many Spokane homes. The refrigeration—scientific and healthful care of food is what we are all interested in. For that reason we are glad to follow us while we enumerate some of the features of "Electro-Kold":



Sold for Cash or
on Convenient
Terms of
Payment

Telephone Main 5171

and our "Electro-Kold" expert will be pleased to call at your home or place of business.

The Washington
Water Power Co.

Telephone Main 5171

Corner Trent and Lincoln

Meets
Every
Refrigerating
Requirement

Can be installed in any good refrigerator.

Economical, because motor runs only when needed.

A freezing compartment makes pure ice cubes for table use.

The same compartment will freeze fish, fowl, maintain them in perfect condition for a long period of time.

Ice cream and frozen desserts can be kept from day to day.

The even temperature maintained below food-spoiling point allows you to keep all edibles a very long while.

The clean, dry, crisp, intense cold prevents dampness or the possibility of odors.

"Electro-Kold" produces pure and healthful refrigeration all the time—without variation of temperature.

Correct Refrigeration
for Your Home

ELECTRO-KOLD



Refrigeration means more than just a cold ice box.

Correct refrigeration in the home can be had by means of the new Electro process, whereby the same temperature is maintained in your refrigerator every minute of the day—winter and summer.

Electro-Kold refrigeration produces cold, crisp, dry air—pure and healthful.

In a special compartment you can freeze ice cubes of uniform size for cooling summer drinks.

Meat and fowl can be frozen and kept for almost an indefinite period of time.

Let our Electro-Kold expert call at your home and explain the other interesting details.

The Washington
Water Power Co.

Corner Trent and Lincoln

Telephone Main 5171

Some of the effectively written advertisements and folders used by The Washington Water Power Company last year in its third season of electric refrigerator sales. The appeal of a make of refrigerator produced in its own territory was used also to good advantage. In a territory of 33,000 residential customers, 24,500 of which are in Spokane, already 137 plants have been sold, and the quota for 1926 is 250 more.

made. This has been found to be a very effective method of showing the refrigerator, and interest in the plant is found invariably to be keen.

Located as we are, in the same city with the factory from which we get our refrigerators, we have entered into an agreement with the factory to service all plants in operation on a time and material basis. To date the servicing has run far less than was anticipated and with correction of preliminary minor difficulties which showed up by the manufacturer, we feel that the servicing feature, so much discussed, is not going to be a serious objection in the future. Where plants are located on our system, outside of Spokane, it has been our practice to have a local man from each town spend about a week at the factory studying the mechanical features of the refrigerator we merchandise, so as to enable him to do the servicing for that locality.

In summing up our electric refrigerator experience, we cannot help but feel that this type of load is one of the most profitable and satisfactory loads a central station can have. From our records, taken during the past year, it has been found that the kilowatt-hour consumption varies from 60 to 75 per month, which at a rate of 3 cents per kw-hr. will result in a very satisfactory annual revenue, particularly in view of the fact that no additional expenditure of money in capital costs is necessary to take on this load.

Our policy as relates to price is that the refrigerators are sold at the list price installed, and with each sale we provide a year of free service to the appliance. An additional charge is made, however, when the plant is purchased on the monthly payment plan to care for the cost of the financing. After the first year, all servicing is paid for by the customer on a time and material basis.

In discussing domestic refrigeration with those who

have purchased machines from the company, we have yet to find one user who is dissatisfied. In fact we never have had a plant turned back to us because of dissatisfaction. Practically every customer who is using a plant is eager to tell his friends about it and the many wonderful features it possesses. Many customers have told us that they would not take ten times what they paid for the plant if it were impossible to replace it. Many machines are purchased, experience shows, by persons who have watched the performance of their neighbors' refrigerators. It has been found, too, that prospects in general know much more about domestic refrigeration machines than they did two years ago. It has been found too that they are more familiar with prices, servicing facilities, and other important factors of that nature which make the merchandising of these appliances an easier task than formerly.

The missionary work is over, and the market now will respond to aggressive sales efforts, it is now felt.

At present there are approximately 33,000 residential customers on the system of The Washington Water Power Company. Of these, 24,500 are residents of Spokane. Although our investigations of electric refrigeration began in 1923, it was not until later in 1924 that the actual selling of plants began, following the placing of the 25 units on a trial basis. In spite of that, we closed 1924 with 34 sales.

Last year, 1925, with our sales efforts gaining headway, we were able to sell 103 domestic plants. And we do not hesitate to say at the present time that during the current year we will sell at least 250 plants.

In the smaller towns served by the company about 50 machines were sold last year, this in spite of the fact that only about half of the 24 principal towns served have had demonstrating machines available.

Turning the Trick with Three Form Letters and a Postcard

Dear Madam:

As one who lives in an up-to-date home, we naturally assume you would be interested in a new system of keeping foods pure and wholesome.

This system is convenient and regulated entirely by automatic electric control.

It is dependable; requires no watching or attention. It is sanitary; producing a coldness that is crisp and dry.

It is reliable winter and summer; temperature is always the same.

It can be installed in any good ice box or refrigerator.

This system is "Correct Refrigeration," and "Correct Refrigeration" is produced by an ELECTRO-KOLD.

We would like to tell you more about the ELECTRO-KOLD for it is an interesting subject. If you wish to discuss the ELECTRO-KOLD with us, just write "YES" across the face of this letter and return it to us.

Very truly yours,

Dear Madam:

Inasmuch as electric refrigeration must be of interest to you, we are going to give you a little more information about an "ELECTRO-KOLD" than that given in our previous letter.

This wonderful system can be installed in any good refrigerator.

It maintains an uniformly cold, crisp, dry atmosphere that keeps foods in a perfect state of refrigeration.

Winter and summer—every hour of the day and night your refrigerator has the same intensely cold temperature.

In a special compartment ice cubes for table use and cooling drinks can be frozen. One of your greatest home keeping problems is now solved for you, that of having foods in a perfect state of refrigeration until you are ready to serve them to the family.

Would you like to have our "Home Refrigeration" man call upon you? Just write the date at the bottom of this letter and return it to us.

Very truly yours,

Dear Madam:

Surely there is something we have overlooked or failed to mention inasmuch as you have not replied to either of the two letters previously sent you in regard to "ELECTRO-KOLD," the new system of domestic refrigeration.

Probably we did not emphasize the fact that one of these little modern plants would soon pay for itself in the saving of food and at the same time, the health of the entire family would be safeguarded because all meats, fish, vegetables, fruit, butter, cream and milk are kept in a clean, wholesome and sanitary manner.

The above facts are very important, but "ELECTRO-KOLD" is a big and interesting subject, and we know there must be other information you would like to have. For this reason, we are enclosing a handy little post card which you can fill in, attach a two cent stamp, and drop in one of Uncle Sam's mail boxes.

Very truly yours,



ELECTRO-KOLD

.....

I would like to know more about Electro-Kold, the New Automatic System of Correct Home Refrigeration.

Name

Address

Date to call

Nothing to Lose—Everything to Gain—Mail This Card NOW

Electric Refrigeration Offers Fertile Field for Contractor-Dealer

By D. D. McFarlane

Secretary-Treasurer, Newbery Electric Corporation, Los Angeles.

NO ELECTRIC appliance heretofore placed on the market has met with a more enthusiastic reception from the public than the electric refrigerator. The potential market for this household electric device offers opportunities which the electrical contractor-dealer or electragist cannot overlook if he would realize all of the profits which his business affords.

With the attention of the entire electrical industry centered on this appliance at the present moment it behooves the dealer to consider his responsibilities in the successful merchandising of electric refrigerators and shape his sales plans accordingly.

In shaping a sales program to cover this appliance the experience of the Newbery Electric Corporation may be of some help to other contractor-dealers. The plan followed by this company is one that any dealer might adopt.

The first problem which faced the company when it was decided to embark upon the sale of refrigerators early in 1925 was the question of advertising. It was decided to allot a certain amount for the initial advertising campaign, and the sum finally allocated was \$5 per machine. Naturally this was an arbitrary amount as no machines had been sold. The company considered that ten refrigerators could be sold the first month so the initial advertising expenditure was \$50. As sales have continued to increase since a start was made, the policy of spending \$5 for advertising for each machine sold has been pursued. The manufacturer came to the assistance of the company and agreed to spend an equivalent amount for each machine shipped into the territory. This advertising now is appearing in southern California newspapers.

The second problem which faced the company at the start was the question of salesmen. As refrigerators were a comparatively new line there were no trained salesmen available. Inexperienced men were chosen and given a thorough schooling in electric refrigeration, with emphasis placed first on the necessity for refrigeration and second on the advantages and low cost of electric refrigeration. These salesmen were placed on a salary and commission basis and immediately placed in the

THE interest which is being created in electric refrigeration by the manufacturers and power companies should be capitalized by the contractor-dealer, in the opinion of the writer. In this article he outlines the successful plans followed out by his company, one of the pioneers to undertake the sale of electric refrigerators in southern California.

field. The results have been very gratifying.

Among the first to be canvassed as prospects for the purchase of refrigerators were architects and home-building companies. Letters and circulars were sent to the majority of men of this class in the territory served by the company announcing the appointment of this firm as Electro-Kold dealers.

Later salesmen called on

some of the architects and builders for the purpose of selling them on the idea of specifying electric refrigeration in the homes they designed or built. At first this seemed like missionary work, but in a very short time the salesmen had more calls than they were able to take care of. In fact the inquiries increased at such a rate from week to week that additional salesmen were necessary. Building permits also were followed up as soon as issued by the building inspector, and many individual prospects were developed in this manner.

As an example of the success enjoyed in working with the home-building companies an instance may be cited where 91 machines were installed in a single block of homes. After considerable missionary work with the Birch O'Neal Construction Company this firm was induced to install machines in a few new homes it was building. Upon completion of the homes it was found that electric refrigerators in the homes furnished the salesmen with a strong argument for prospective purchasers. This experience resulted in an order for 91 machines which are being installed at the rate of ten per month in homes costing in the neighborhood of \$12,000 to \$15,000. The Birch O'Neal company recently has started another subdivision in Beverly Hills and is planning to install an electric refrigerator in each of the new homes to be constructed there. Advantage was taken of these installations further to advertise electric refrigeration. Each home and the entire block was placarded with the announcement that Electro-Kold refrigerators were installed.

Apartment houses offer another field of large purchasers which the contractor-dealer may cultivate. If the argument is used that electric refrigerators constitute a strong inducement in renting apartments, little difficulty will be experienced

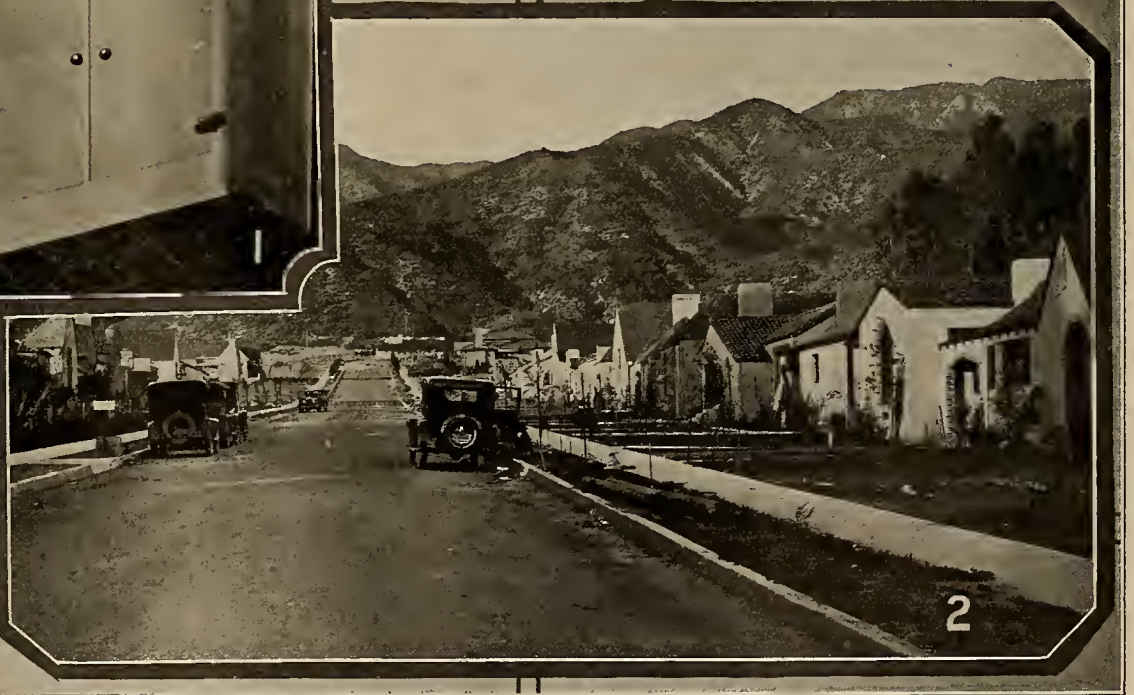
in selling the apartment-house owner on their installation at the time the apartment house is built.

The success experienced in following up building permits shows that not only the refrigerator itself will mean profitable business for the contractor-dealer but that it serves as a means of inter-

of electric refrigerators by the contractor-dealer is the question of servicing. While the refrigerator requires very little service work, when such service is required the man who does the work must be an experienced electrician and mechanic. This type of man usually can be found in the em-



BUILT-IN electric refrigerators are found to be advantageous to the sale of new homes in southern California. And to the electrical contractor, this presents an opportunity. The Newbery Electric Corporation of Los Angeles has developed this type of business to a fine degree, selling refrigerators to a builder in quantity. (1) The refrigerator, attractively housed, is made a distinctive feature of a new house. (2) A subdivision of new homes, each of which is equipped with an electric refrigerator.



esting the home-owner in additional electrical equipment. In one case recently handled by one of the firm's salesmen the contact established with the home-owner at the time an electric refrigerator was sold resulted in the sale of a complete installation of fixtures, a washing machine, an ironing machine, a radio set and a kitchen unit. Thus a sale which originally would have meant less than \$1,000 was built up to a point where it resulted in the sale of merchandise and labor worth \$4,000.

An additional argument in favor of the selling

ploy of an electrical contractor but seldom in a furniture or household furnishing goods establishment.

In the opinion of the writer the sale of electric refrigerators is a function of the contractor-dealer as well as the central station. With the public interest which is being created by the manufacturers and power companies through advertising and sales work keyed to a high pitch, the contractor-dealer or electragist who enters this field in an intelligent manner cannot help but prosper in proportion to the sales effort he expends.

Backseat Selling

A Salesman's Wife Answers the Question "Should the Wives of Utility Employees Take an Interest in Their Husband's Business?"

By Mrs. H. B. Rogers

Wife of the Spokane manager, Pacific States Electric Company

MISTER Man remarks about Mister Cloak Salesman's wife wearing nifty coats or remarks about Mister Electric Salesman's wife having such a complete electric home. Mister Cloak Salesman's wife will tell you and will tell all her friends just what make of coat it is, because that is the make her husband sells. Mister Electric Salesman's wife shows all of her electrical appliances, fixtures and so forth to her friends and acquaintances and always casually adds it is "Such and Such" a make of appliance and she will even demonstrate them for you.

For years the salesman's wife has created acceptance of her husband's wares, even taking orders and adding to the salesman's limited knowledge a goodly share of his sales talks.

Triple X brand of hams is used by Mrs. Triple X salesman's wife. And she has even been known to feed it to doubting Graces and Ediths.

A salesman always makes his first sale to his wife and she sometimes buys a lemon but she is not long in ignorance. Selling your wife is not such an easy task and cases have been known where a salesman has changed his line on that account.

Wives can be a wonderful help to all branches of industry. All of us have read lots of advertising to attract the women that had no value because some wife was not the proof reader.

Salesmen's wives take up a lot of time in conversations at little gatherings of women in exploiting their husband's merchandise and the funny thing, too, is that she holds an interested audience, creating an opinion that she is well versed on the subject, and generally she is. She receives telephone calls and personal visits, in regard to the hows and whys of that particular merchandise. Women are always proud of accomplishments and possess a vanity in knowing and doing as well as in personal appearance.

Salesmen do not fear their wives talking, their fears are confined, if any, to a fear that their wives will not talk. A successful salesman, nine times out of ten, possesses an exceptional salesman in his wife, a pair of salesmen, so to speak, Mr. Salesman and Mr. Salesman's wife.

"Why, Mrs. Smith, how you would enjoy an electric range, such an advantage over gas, just turn a switch, etc." All wives have heard that talk or a similar one and it always ends with something like this, "Now, you know my wonderful range." The answer is, Mr. Wonderful Range Salesman's wife is talking and when she is talking she is working and when she is working, she is in business with her husband.

Quite a few salesmen's wives are constantly in

contact with their husband's business friends' wives and from them the wife picks her acquaintances and friends she carries through life, and very dear friends some of them become.

Women carry very little weight in soliciting votes to help elect a party if they solicit them from women to whom they are practically unknown. But let one woman sell her friend with the idea that a certain party is a good man to elect to office and this friend wants, and furthermore tries to sell another friend with the same idea. That idea working well cannot be beaten. Think for yourselves—it works in carrying scandal, and it works in carrying good news.

If you are in a gathering of women and subject is discussed in which your husband is interested, you as a good wife owe it to your husband to be willing to defend his interests by standing up for his business, to rectify any mistaken ideas and to know the subject so well that you can talk convincingly on the same.

In a gathering of men, your opinion is seldom wanted and if it is, it will be asked for, sometimes out of policy and on rare occasions, solicited.

Man is a funny creature. He places himself on a pedestal and stands exalted before the world. Nine times out of ten, there is some woman steadying the pedestal to keep it from tipping.

Advantages of Domestic Electric Refrigeration to the Central Station

By J. H. Cunningham*

Manager Central Supply Department, General Electric Company, Los Angeles.

THE most desirable load for the central station is one which will return the maximum revenue with the minimum investment in power plants, substations, distribution systems and similar equipment. A load of this character is one where the ratio of kilowatt hours to kilowatt demand is high, or in other words, a load with a good load factor. If, in addition to a good load factor, a relatively large proportion of the load is of such a character as to demand the higher rate charges, a very desirable state of affairs exists for the central stations.

The domestic electric refrigerator is an ideal load from this standpoint. Nearly all modern refrigerators are controlled automatically by thermostats or their equivalent so that the driving motor stops at varying intervals. The load curve of any individual machine will be a series of rectangles, and, as the number of machines on the system increases, this curve tends toward a straight line rising somewhat at meal times due to the greater number of door openings and consequent increased heat leakage.

The average power input of a domestic electric refrigerator is in the neighborhood of 250 watts, which is lower than most household appliances,

*From a recent address before the Los Angeles Electric Club.

but on the other hand the ratio of operating time to total time makes the power per kilowatt of demand extremely high.

With weather conditions as they exist in California, the motor of a refrigerator will run probably from six to eight hours a day, and on this basis its annual return in revenue is equal to that of 32 washing machines, 50 electric fans, 29 vacuum cleaners, or 11 electric irons. The annual revenue for each kilowatt of demand for the electric refrigerator is equal to the annual revenue for each kilowatt of demand for 53 waffle irons, 4 electric ranges, 36 toasters or 25 percolators.

The refrigerator does not add perceptibly to the demand of a power system and adds relatively little to its peak load. Therefore, a very large number can be added to the lines without any investment whatever in new equipment.

The Merchandising and Future of Electric Refrigeration

By L. D. Robertson*

Pacific Coast Sales Manager, Kelvinator Corporation, Los Angeles.

IT IS unnecessary to review the merchandising methods of the early days of this industry, except to say that it began like many other specialties in that it had to be nursed along like a delicate child and shielded from danger and disease that it might not die in its infancy. It has survived and is not only strong and healthy but at times threatens to break away from its parents. The exploitation of electric refrigeration could not be hurried. Those who tried that method failed. It has been a case of slow and careful development.

The industry is not so much interested in the past as in the present and future. What are the merchandising possibilities of electric refrigerators? Look for a moment at the history of some other specialties.

Look at the vacuum cleaner—twenty years ago a home that boasted one of those devices was exceptional. And the motor car—twenty years ago a rich man's toy, cursed by country people because it scared up their horses and kicked up dust.

Why have all these specialties become such huge business? Because of their convenience. Because they did a better job. Would you give up your motor cars, even if street cars were free? Would your wife give up her vacuum cleaner because brooms are still a dollar and a good cleaner costs \$60? No! Because you and she have found out that those machines do a better job and are worth what they cost.

But it took time, work and advertising to educate the public.

The same public is just beginning to become educated to electric refrigeration. Even two years ago the idea had to be sold. Now it is a question of "which one?"

The chief sales resistance to electric refrigera-

tion is price. Please mark this—The only ones who say an electric refrigerator is dear are those who do not have one. Those who have them would no more go back to old methods than you would take out your electric lights and burn gas or sell your motor cars and ride in a bus.

Most of these things cited cost much more than the methods which they replaced. Electric refrigeration is less expensive than the old-fashioned methods when saving of food, health and convenience all are considered, and as a dividend on the investment there are a hundred and one frozen dainties that can be made.

Let us "cash in" by using these advantages in our merchandising methods. Let us advertise. Let us tell the people the facts. And above all, when they trust us with their orders, let us not take advantage of their ignorance of our product but rather use our knowledge to supply them with what they should have.

Let our business methods be open and above board. Let competition be keen but clean. Let the service we render the purchaser be at least equal to our monetary gain, and the profit will be mutual.

Now, what of the future? Again let us look at a few examples of others' past that we may in a measure judge of our own future.

We well remember when Henry Ford announced that he would build ten thousand motor cars the next year, and now he is making upwards of six thousand every day. Or when Marconi sent his first dot-and-dash message without wires, who could have imagined the radio business of the past year?

Manufacturers of electric refrigerating machines made and sold four times as many machines in 1925 as in all previous years added together, and it is estimated that 1926 will see five times as many built as in 1925.

Our field for household machines is limited only by the supply of current, and high lines are reaching out everywhere. Ice-cream-cabinet business has only begun. Other fields remain untouched, such as restaurants, grocery stores, refrigerated show cases and the like.

Milk used to be hauled about in tin cans and doled out to customers with a dipper. Today it is delivered in sanitary bottles. The milk wagon of the future will be refrigerated electrically.

The refrigerated railroad car of the future will be kept cold by the turning of the wheels on which it rolls just as Pullmans are lighted today. Every passenger train will have its refrigerating plant.

It will take ten or twenty years to work our present field. By that time the demand will have increased to an unbelievable extent. Moreover, the present machines will be worn out or out of date, then and the same field will have to be supplied again.

This is not an idle dream. It has happened in many other lines, and it will be repeated with electric refrigeration.

*From a recent address before the Los Angeles Electric Club.

Local Developments in Motor-Driven Pumps for Underground Work*

Where it is impossible to make proper sewer connections to protect the underground equipment and to enable workmen to enter vaults in connection with underground circuits, it is necessary to remove the water at certain intervals.

The first method employed was the use of ordinary buckets, with a piece of rope attached, (Fig. 1-a) to lift the water from the hole and dump it on the street. Allowed to seep away as best it could it left the street in a dirty condition. Another early method used was a hand pump. This was a diaphragm pump and was very successful. (Fig. 1-b.) These methods were possible in the days when the manholes were small and traffic on the street light.

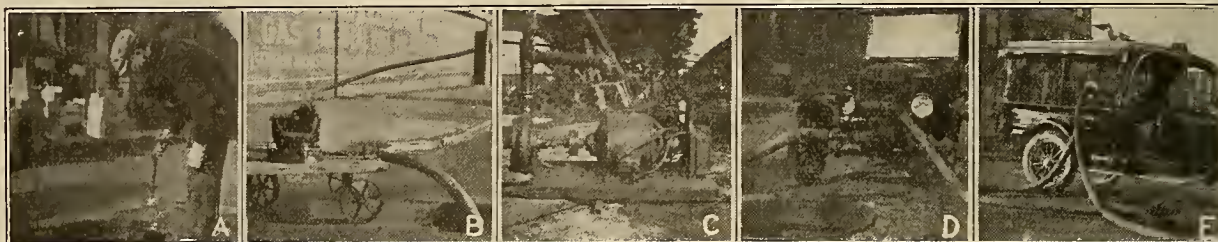


Fig. 1.—Evolution of manhole pumping: (a) old bucket-and-rope method; (b) hand pump; (c) portable electric motor-driven centrifugal pump; (d) centrifugal pump mounted on frame of car and driven by car engine; (e) gear pump in action, driven by car engine.

However, conditions have changed and now it is necessary to build larger vaults and when cleaning them, in most instances, to convey the water to a cesspool or to gutter. In some cases where there is much mud deposited in the hole it is necessary to haul it away.

This can be accomplished easily and quickly by using a power-driven pump with a discharge hose. The pump can be driven by an electric motor or a gas engine, (Fig. 1-c). The electric motor may be operated from an electric truck or directly from the distribution lines. However, the latter is not good practice for emergency work as connections cannot be made when the vault is filled with water. The electric-driven pump can be used to good advantage, however, in the construction of conduit lines where it is necessary to drain the excavation while the duct is being installed. A type of pump which has proved very satisfactory for pumping out vaults is one designed for attachment to certain standard makes of motor cars and using a simple power take-off from the motive power of the car, Fig. 1-d.

This pump is the centrifugal type, well constructed, and is attached to the front end of the frame of the car in line with the crankshaft. The weight of the pump therefore is carried on the frame, and none of the weight or strain is carried by the crankshaft or motor. The pump is driven by a floating shaft from the motor. A small hand clutch is used to disengage the power unit while moving the car and pump can be left in position without strain or damage to the car or pump. The entire equipment can be installed in about two hours. The pump itself can be removed from the hanger by removing three cap screws and may be carried in the body of the machine if necessary. This operation should not exceed three or four minutes' time.

These pumps can be obtained in 2½ or 3-in. sizes, using 3 or 3½-in. suction hose, respectively, and will lift water over 20 ft. with a discharge capacity of from 200 to 250 gal. per min. for the 2½-in. size and about 300 gal. per min. for the 3-in. size, at an engine speed corresponding to about an 18-mi.-per-hr. driving speed. This pumping outfit is one that can be transported quickly and economically from one location to another with a minimum loss

of time. Automatic primers can be installed and are very convenient. The vacuum which operates the primer is taken from the intake manifold of the motor. Small sticks, mud and gravel readily will pass through without serious injury to the pump.

Very satisfactory results have been obtained with a unit consisting of a Dodge screen body truck on which is mounted a gear pump driven by a power take-off from the truck-engine, Fig. 1-e. This pump is one of high efficiency, having only two moving parts and with a lift of better than 20 ft. The pump has a capacity of 100 gal. per min. operating at about 250 r.p.m. To date no difficulty has been encountered from clogging or damaging the pump with foreign matter which often is picked from the vaults.

An inexpensive and useful pumping unit can be assembled and has been used very successfully. This consists of a rotary pump driven by any standard

power take-off. This is ideal equipment, for these pumps have a positive suction and therefore need not be primed. They are small in size, simple in construction, strong and durable, and when damaged can easily and quickly be repaired. They are made in various sizes, and although the lift is not as great as that of the centrifugal pump, they will pick up the water readily at 15 ft. without priming.

Where it is inadvisable to install pumping equipment on a machine a trailer can be used. For hand work the diaphragm pump is the most successful. When a power unit is desired any of the types of pumps previously mentioned may be equipped with a gas engine and the complete unit installed on a trailer. These units are found to be very useful and do not tie up transportation equipment where there is little moving required and large quantities of water are to be pumped at once location.

Experience has taught that the Ford standard chassis is too light for use in cleaning manholes where much mud accumulation exists, for it is very easy to overload the equipment. Therefore machines such as Ford trucks, Ford dump, Dodge trucks, or cars of this type give longer and more efficient serv-



Fig. 2.—Permanent installation of gear pump in Dodge screen-body truck.

*Serial Report, Underground Systems Committee, Pacific Coast Electrical Association. P. E. Chapman, Pacific Gas and Electric Company, Chairman. Report prepared by R. P. Lutz, Pacific Gas and Electric Company, member of Underground Systems Committee.

ice where the class of work demands it. Larger quantities of mud can be handled at one time and this item is worth consideration where it is necessary for a long haul to a convenient dump. The possible damage to the lighter machine from overloading also should be considered.

It is essential to use foot valves with all types of pumps as the suction is held much better, and there is less chance for clogging or damaging the pump with foreign matter which may be in the vault.

For choosing equipment due consideration should be given to the class of work to be done. Then the type of unit best suited for that particular work should be selected, not overlooking the fact that durability and simplicity are the essentials that keep the equipment on the job at all times.

Cement Duct—Analysis of Chemical Actions on Lead Cable*

Portland cement on the market has the approximate composition of

Si O ₂	22
Al ₂ O ₃	7
Fe ₂ O ₃	3
Ca O.....	62
Mgo.....	3
SO ₃	2
Alkalies).....	
Water).....	1
CO ₂).....	
100	

and mainly is a solid solution of lime, silica and alumina; the latter referred to as alite. The setting of wetted cement appears to be the joint effect of several different actions not yet clearly understood. The main reaction probably is the formation of colloidal calcium aluminosilicates. These decompose, forming crystals of tricalcium aluminate and a number of other substances in a colloidal condition.

Concrete made from standard Portland cements and the filler ingredients should show no large soluble proportion; the bulk of soluble material is in the form of calcium hydroxide. This substance is strongly alkaline and acts under certain conditions as does any other base. Exposed to air, calcium hydroxide soon is converted into calcium carbonate, insoluble in water and crystalline enough to fill in as a strong binder.

The action of calcium hydroxide on metallic lead is not understood clearly at present, but under some conditions lead hydroxide is formed which is soluble in an excess of the alkali, forming plumbites such as Pb (O Ca O). Lead oxidizes superficially in air first forming suboxide Pb₂O. This substance in the presence of soluble carbonates renders the protective coating of insoluble lead (basic) carbonate. Free, moist CO₂ in contact with lead gives the soluble (acid) carbonate. The sample of concrete duct under observation showed no free magnesium, but a small amount of free lime. Determination of this free lime was made as follows: 25 g. of sample were ground, leached, filtered, washed and diluted to 250 cc. A 25-cc. sample required 1.35 cc. N/10 H₂ SO₄ to neutralize, which represents 0.0050 g. of Ca (OH)₂ or 0.0038 g. of CaO in a 2.5 g. sample, or, in percentage, 0.20 per cent free Ca (OH)₂ or 0.15 per cent free CaO. This amount probably would be much greater in freshly made duct and considerably less in well aged duct. And in time all free Ca (OH)₂ and CaO would be converted into the insoluble CaCO₃.

Even if this percentage of lime did persist in the duct and the reaction with lead were permitted to go on to completion, the lead involved would be so slight as to be negligible.

A specimen of lead cable was immersed in the

above strength of lime solution for 12 days without any indication of action, and in an analysis no lead appeared in the solution. Where the cable was in contact with the solution, however, there was a slight darkening of the metal, probably due to the formation of one of the lower oxides which would eventually pass to the insoluble basic carbonate.

Low-Cost High-Tension Metering for Operating Purposes*

Last year's subcommittee covered the investigation of oil-insulated and bushing current transformers available for this class of metering. This year the subcommittee investigated the use of air-insulated transformers. A Niagara transformer, manufactured by the Niagara Electric Improvement Company, was tested for ratio and phase angle under a variety of conditions.

The transformer tested was selected at random from a shipment of six similar transformers, the name plate data of which were as follows:

Rated Voltage—66 kv.
Amp. Primary—200/400.
Amp. Secondary—5.
Nominal Ratio—49.80/1.
Frequency—50 cycles.

Results are given in Table I.

This transformer has several interesting features not usually found in current transformers, in addition to its unique shape and method of insulation. The primary winding has connected in parallel with it a shunting resistance the adjustment of which makes it possible to shift the phase-angle curve with reference to the zero axis. The core has wound upon it a tertiary winding consisting of about 50 turns of No. 18 bare resistance wire short circuited on itself. This also is for the purpose of adjusting the position of the phase-angle curve. The secondary winding has two taps for adjustment of ratio error; one of these, the full winding, has 399 turns; the other has two turns less or 397 turns. The ratio and phase angle were determined by means of a Leeds Northrup-Silsbee current transformer testing set.

Table I—Tests on air-insulated current transformers.

Test No.	Burden	Volt-amp.		Ratio Error		Phase Angle	
		100 per cent load		10 per cent load		100 per cent load	
1.	4-12-amp. CR relay on 5-amp. tap; SY ammeter, 5-amp.	20		1.000	1.0025	(min. of angle) —22	—13
2.	4-12-amp. CO relay on 10-amp tap; SY ammeter, 5-amp.	10		0.997	0.999	—20	—13
3.	Weston model 155, 5-amp. ammeter			0.9955	0.9955	—20	—10
4.	Weston 155, 5-amp. ammeter; Weston 310, 5-amp. wattmeter; G.E. IB-6 5-amp. test meter....			0.996	0.996	+9	—10
5.	10 volt-amp. at 0.9 p.f., full secondary winding.						
	Primary Shunt Resistance						
	10 ohms.....			0.9965	0.9958	—37	—29
	Infinite			0.9960	0.9944	—18	—10
	Change in Correction..			0.0005	0.0014	+19	+19

The first four of the above tests were made with the full secondary winding of the transformer and with 33 ohms in the primary shunt. The effect of changing the primary shunt is indicated in item 5.

The effect of stray fields on this class of transformer was tested. The primary connection leads were placed 1 ft. from the primary winding. The influence of the current in the primary connecting lead caused a change in the ratio curve of approximately 1 per cent at 0.5 and 0.7 per cent at 5 amp. with but a variation of 3 min. in the position of the phase-angle curve.

From these results it is apparent that this transformer is sufficiently accurate for metering purposes.

*Supplemental Report, Underground Systems Committee, Pacific Coast Electrical Association. P. E. Chapman, Pacific Gas and Electric Company, Chairman. Cement duct subcommittee: H. H. Buell, chairman; H. C. Moyer, R. P. Lutzl, all of Pacific Gas and Electric Company.

*Serial Report of the Meter Committee, P.C.E.A. R. G. Jones, The Southern Sierras Power Company, Chairman. Report prepared by W. N. Lindblad, Pacific Gas and Electric Company, and L. L. Conrad, Southern California Edison Company.

CENTRAL STATION CONSTRUCTION OPERATION AND MAINTENANCE

Plant Additions Necessitate Line Reconstruction Few Replacements and Little Tower Reinforcing Needed to Recondition 60-kv. Line After 14 Years.

By A. Vilstrup, Assistant Engineer, Electrical Engineering Department, British Columbia Electric Railway Company, Ltd., Vancouver.

Increase in the generating capacity of the Stave Falls hydro plant of the British Columbia Electric Railway Company, Ltd., and the company's other developments on the Stave River necessitated the reconstruction of one of the company's main transmission lines. The line in question is about 32 miles long, of double-circuit construction, and operates at 60 kv. It is an important link in the transmission system on the lower mainland of British Columbia connecting the Stave Falls plant with the principal load center in Vancouver.

Original construction of the line was by the Western Power Company of Canada in 1911. Until the summer of 1925 the original No. 0 stranded copper conductors of the line were sufficient. The replacing conductors are 300,000 circ. mil stranded copper. This obviously is more than required for the present, but will take care of the future developments in the Stave section.

New insulators also were installed throughout the length of the line at the time that the line was rebuilt. Certain operating troubles were reduced materially by increasing the number of insulator units from 3 to 4 in suspension strings and from 4 to 5 in strain and semi-anchor strings. All insulator units are Canadian Porcelain Company 10-in. disks.

Existing steel towers were rein-

forced where necessary to care for the increased mechanical loading. In a few instances an intermediate tower was installed to reduce the length of a span. These spans wherein intermediate towers were installed were those where the clearance to ground or to other circuits crossing beneath could be maintained with the original tower spacing. At two points where the line makes abrupt angles the original steel towers were replaced by twin-pole (wood) corner structures, heavily guyed. At two other locations wooden A-frames were erected to take care of dead-ending the conductors. Figs. 1 and 2 show typical examples of this wood construction.

In stringing the heavier conductors and still maintaining the necessary clearance between the lowest conductor and ground it was necessary to employ greater stringing tension than had been used for the lighter conductors initially installed. Apart from the special care which had to be taken during the stringing operations to avoid the buckling of crossarms and otherwise injuring the towers, this condition did not affect greatly the ordinary suspension towers on straight line sections over flat ground. The greatest trouble was experienced where the line makes sharp turns either vertically or horizontally. Fortunately there were not many of these locations and the worst were taken care of by the wooden A-frames and the 2-pole structures already mentioned. Smaller angles were dealt with by reinforcing the existing towers, chiefly by installing heavier crossarms and suitable guying as shown in Fig. 3. However, local conditions in each case were studied and prescribed for. The installation of heavy guys normal to the line could not always be made conveniently, necessitating dead-ends in some instances. In these cases the conductors were strung slack around a corner.

The number of dead-ends on the line was reduced to a minimum, but semi-anchoring of the conductors at regular intervals was followed consistently, usually every fourth tower. This construction was resorted to with a view to overcoming a tendency toward unequal wire sag under severe snow conditions. Trouble from this cause had been experienced on this line in the past. Fig. 4 shows a typical section of line, semi-anchor tower in the foreground.

Average spacing of the line towers

is 550 ft. where the line follows a public highway. Where the line traverses private rights-of-way and where a lower clearance to ground is permissible the average span is 660 ft. Ground depressions in many cases permitted longer than normal spans.

While the foregoing in the main covers the transmission reconstruction, certain special features were involved at the Pitt River crossing. This crossing involves a single span of 1,360 ft., both circuits carried on one pair of towers. As this span is too long to permit the use of copper conductors within available sag limits, copper-weld steel cables $\frac{5}{8}$ -in. in diam. replaced original $\frac{1}{2}$ -in. galvanized steel cables. Tower structures at this crossing consist of a 160-ft. tower on each bank of the river and a rocker-tower on which the conductors are dead-ended. These rocker-towers are guyed heavily to concrete anchors buried in the ground. These two types of towers are shown in Figs. 5 and 6, respectively.

On the main towers the conductors are supported on sheaves suspended from double insulator strings mounted on suitable yokes. The upper two conductors are carried on a double set of 3-sheave supports, the details of which are shown in Fig. 7. This type of support was used to gain vertical clearance between conductors and adjacent lower crossarms. The lower conductor of each line is carried on a double set of single sheave support as indicated in Fig. 8.

At the rocker towers the span conductors served around 14-in. sheaves attached to the towers by an arrangement of strain insulators and yokes similar to that used on the main river-crossing towers. Heavy 4-



Fig. 1.—Special 2-pole corner tower.



Fig. 2.—Special A-frame dead-end.

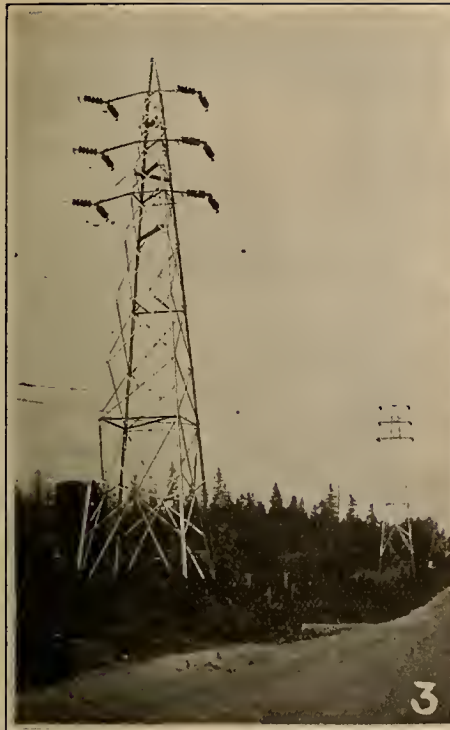


Fig. 3.—Strain tower for angle positions; heavier material than standard.



Fig. 4.—Semi-dead-end construction on standard tower.

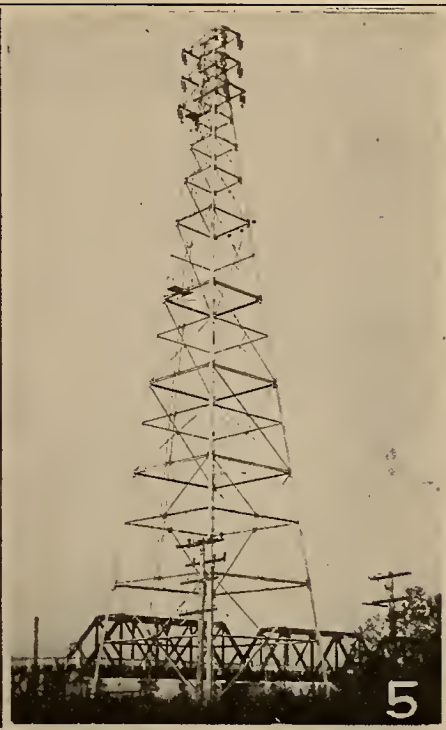


Fig. 5.—Main tower west bank Pitt River; 160 ft. high, carries 2 lines.

bolt clamps with babbitt-lined parallel grooves are used to secure the copper-weld conductors. All of the sheaves used are bronze-bushed and able to turn freely, the groove of the sheave is carefully machined to remove any roughness in the casting which might injure the copper sheathing of the conductor cables. In reconstructing the crossing it was possible through the use of copper-weld cable, to keep within the stresses for

which the towers were designed originally.

One more noteworthy feature in connection with the reconstruction was the necessity for interfering as little as possible with the operation of the transmission line during the reconstruction period. Naturally this affected the working methods and, to some extent, the selection of materials for reinforcing the towers that needed reinforcing. As far as possible only one circuit was touched at any one time. However, during working hours both circuits were kept out of service; the one not being worked on kept in readiness for emergency service on short notice. At the end of the working day this circuit invariably was energized and maintained in normal service until work began the following morning.

Reconstruction work was carried on by the company's own line department, with four gangs employed simul-

taneously on as many sections of the line during the greater portion of the time. No mishap or loss of time occurred during the length of the job, either from operating contingencies or other causes.

Did You Know?

One ounce of gold pays wages for—
Twenty hours' work in the United States;
Fifty hours' work in Great Britain;
Ninety hours' work in Japan;
One hundred hours' work in France;
Two hundred hours' work in Germany.

This means that Americans must maintain their past record for high output per man to guarantee the prosperity which will mean steady jobs for all.

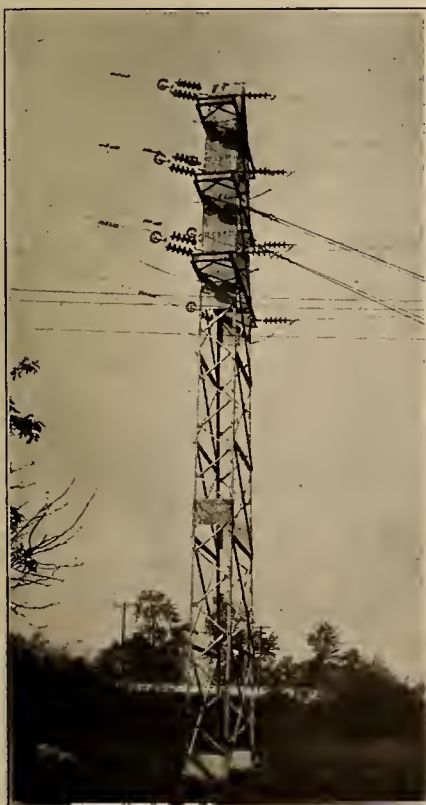


Fig. 6.—Anchor tower for Pitt River crossing span of 1,360 ft.

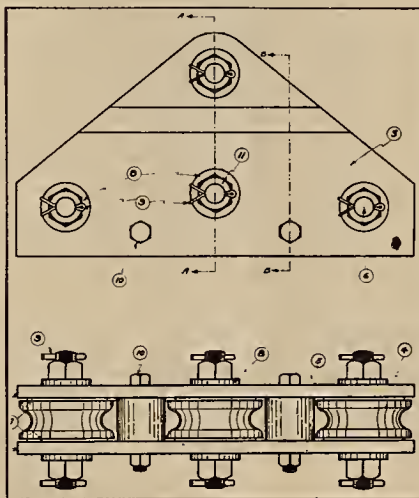


Fig. 7.—Details of 3-sheave conductor support for Pitt River crossing.



Fig. 8.—Single-sheave conductor support for Pitt River crossing.

Ground Detectors Warn of Dangerous Conditions--II

Design Features and Operating Characteristics of Various Types of Instruments Outlined and Compared

By L. F. Hunt, Development Engineer, Southern California Edison Company, Los Angeles.

Details of the Armstrong, volt-meter, and hot-wire types of ground detectors were given in the first section of this article, appearing on page 262 of the April 1 issue of the Journal of Electricity. The two remaining types are discussed in the following paragraphs:

Potential Type*

The potential-type ground detector consists of a voltmeter and relay combination as shown in Fig. 7. The voltmeter scale is calibrated directly in per-cent ground, from 0 to 100. Thus the voltmeter becomes a ground indicator showing the degree of intensity of the fault; for no ground the instrument reads zero and for full ground reads 100 per cent. The relay is a Westinghouse type CV calibrated to close its contacts when the ground intensity exceeds 10 per cent. Closure of the relay contacts sounds the alarm bell. On the rear of the panel are mounted a bell-ringing transformer and the alarm bell.

The ground detector is connected across the open delta of a star-delta bank of three potential transformers as shown in Fig. 8. The relay and meter are in parallel, the bell circuit energized from any convenient 110-volt source through the bell-ringing transformer. Relay contacts control the circuit of the high side of the bell-ringing transformer, the low side being connected directly to the bell. The reason for this particular con-

nection is that it imposes a lower current-interrupting duty upon the relay contacts and, further, does not keep the transformer energized. The knife switch opens the circuit of the operating coil of the relay. This provides a satisfactory control of the ringing of the bell in cases of trouble. The push-button shorts out the voltmeter resistance permitting a 10-to-1 scale deflection for a very small ground. It is used for checking purposes only when the instrument indicates less than 10 per cent ground.

When a ground occurs the voltage from line to ground is reduced, unbalancing the 3-phase voltage and causing the unbalanced voltage to appear across the open delta of the potential transformer secondaries. This voltage acts upon the instrument which gives a direct indication of the ground intensity. For grounds of less than 10 per cent a very accurate reading can be obtained by depressing the push-button as previously mentioned. If the button is used when the bell rings, or when the indication shows a ground of more than 10 per cent, damage to the instrument is likely to result.

The advantages of this type of ground detector are that it gives a very definite reading in a tangible method; it is very accurate; it is fool-proof; it indicates the slightest ground conveniently. Its disadvantages are that it does not show which phase may be in trouble; it requires three potential transformers.

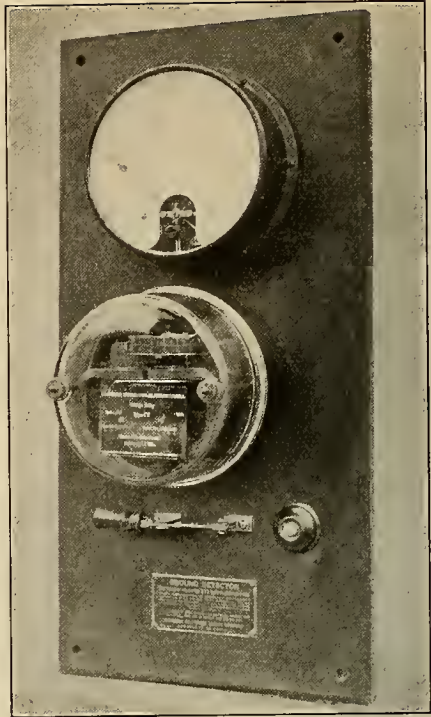


Fig. 7.—Potential type ground detector.

Vectors are as shown in Fig. 2. Under normal conditions and without a ground on the system the vectors $\phi_t=0$, therefore no meter indication. Conditions for full ground on C phase (center) shows the voltage across C transformer to be zero and the resulting changes in secondary voltages; $WZ=190$, causing the meter to indicate 100 per cent ground. A ground on C phase causing the volt-

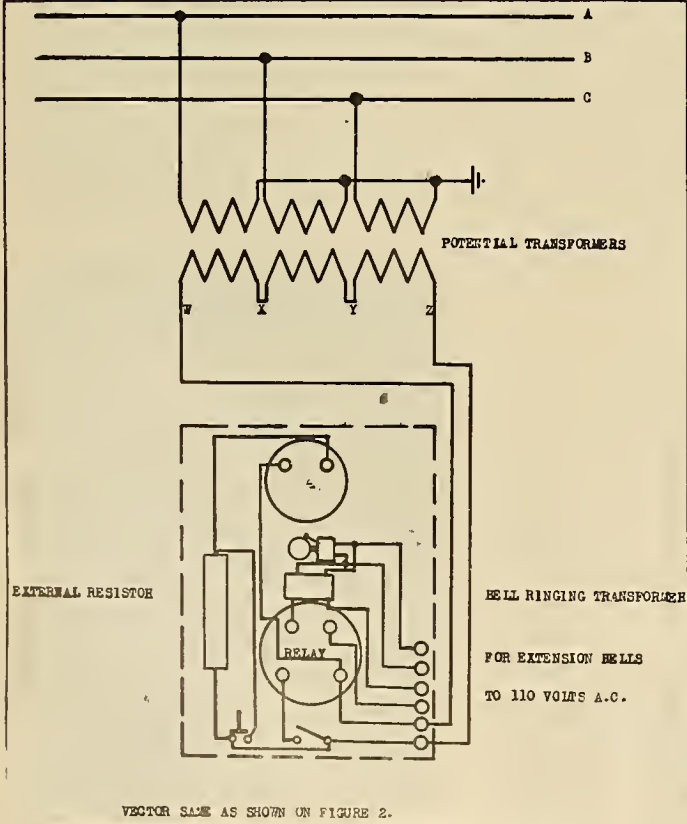


Fig. 8.—Wiring diagram for potential type ground detector.

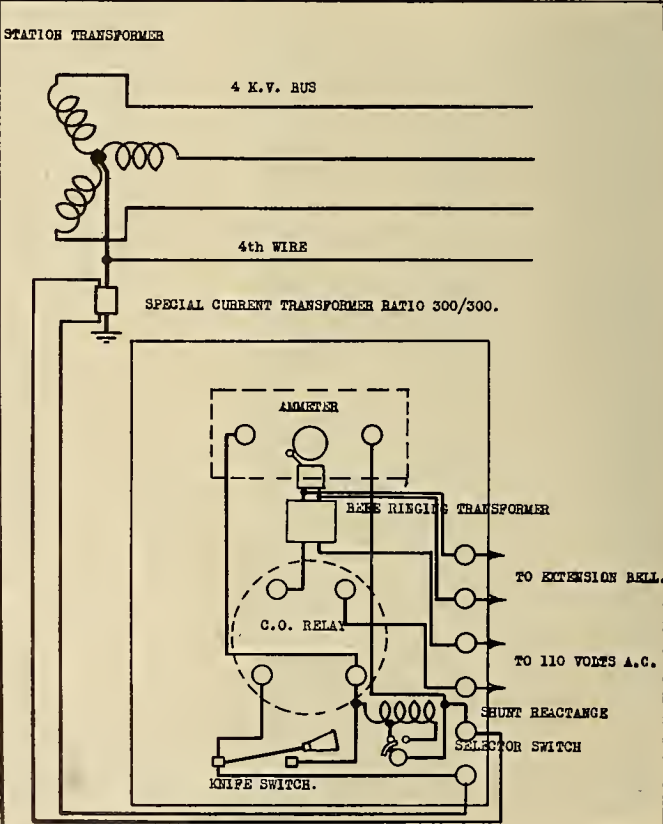


Fig. 9.—Wiring diagram for current type ground detector.

*Patent pending.

age of that phase to ground to be reduced half gives the results shown (right); $WZ=95$ volts, causing detector to indicate 50-per-cent ground. In other words, the meter indicates grounds in proportion to the phase-voltage drop (to ground).

This type is used practically exclusively on the Southern California Edison Company's system, superseding older types.

Current Type

Later developments of distribution systems include a 4-kv., 4-wire grounded-neutral system. In this system the substation transformer bank is star-connected on the low side, the neutral solidly grounded. However, it is possible to have a case of trouble, such as a wire down on dry earth or on pavement, without causing a kick-out of the breaker controlling the circuit. Some means had to be devised to ascertain conditions when lines are grounded by faults.

Voltage changes as used in previously described ground detectors will not serve here because the neutral is grounded and no voltage change will result from slight grounds. The only available method is the use of a current-measuring device. The apparatus made up consists of a low-energy over-current relay, a sensitive ammeter with a heavy shunt reactance, bell alarm and current transformer of special ratio, 300/300.

Electrical connections are as shown in Fig. 9. As indicated, the special current transformer is connected in the grounded neutral lead from the station transformer bank, thus catching all ground currents returning thereto. The general appearance of the complete instrument is quite similar to that of the potential type.

In this scheme it is imperative to leave off all transformer and neutral grounds, with the exception of the neutral ground of the main bank which goes through the special current transformer actuating the detector.

When any line becomes grounded the ground return current must pass through the ground-detector current-transformer, thus indicating on the ammeter of the detector. The normal range of the ammeter is from 0 to 100 amp. The relay will close its contacts, causing the alarm bell to ring, when ground currents of 1 or 2 amp. flow. This value may be adjusted by changing the tap-screw in the relay. Closure of the knife switch will stop the bell in case it is ringing or prevent its ringing by shorting out the operating coil of the relay. If the ground is of especially low intensity a sensitive reading may be obtained by manipulation of the scale switch. This switch cuts in more reactance in such a ratio that the range of the scale is changed to 0-to-10 amp. The second step of this switch gives a scale range of 0-to-1 amp. With this selection of scale ranges, through the manipulation of a switch, accurate readings of ground currents varying anywhere from 0 to 100 amp. may be obtained.

The special current transformer is made with a very heavy primary so as to have a copper cross-section as large as the conductors leading to it.

The ratio of 300/300 is to represent this fact. In transformers used the primary has copper equivalent to 4/0 copper wire.

The very sensitive ammeter arrangement is necessary because many grounds appear that dry off to a high resistance in a short time due to the current flow. Consequently the current flow conceivably might drop to very low values requiring all of the flexibility provided in this instrument.

The major advantage to this type of instrument is that it will measure slight grounds without being affected by imbalanced currents. Its disadvantage is that it requires several special pieces of apparatus.

Single Vault Serves Eighteen Blocks of Street Lights

By W. C. Foster, Assistant Operating Engineer, Portland Electric Power Company.

Eighteen blocks of new street-lighting system were placed in operation in Portland, Ore., in November. This system extends along Broadway from the Broadway bridge south to Jefferson Street. Six Union Metal standards are used per block. Each standard carries 2 G. E. Novalux units with rippled medium alabaster globes and canopies and fitted with 20-amp. 15,000-lumen (1,500-cp.) lamps. The light center is 19 ft. above the street and the 98-ft. spacing between pairs of standards in the block and 65-ft. spacing between pairs of standards at street intersections gives an average of 8.66 lumens per sq. ft. on the street.

The system is divided into 6 circuits, each circuit being fed by a 40-kw., 6.6-amp. constant-current transformer. These transformers are operated 2 in parallel on a 2.4-kv. primary, each pair connected from one leg to neutral on a 4.5-kv., Y-connected distribution feeder. One transformer of each parallel pair feeds a lamp circuit north from, and the other transformer feeds a lamp circuit south, from Stark Street. This makes a total of 3 circuits each way from this main vault as indicated in Fig. 2.

North and south circuits feeding from one pair of transformers supply standards at northeast and southwest corners of street intersections. A second pair supplies the northwest and southeast corners at street intersections. Standards in the centers of the blocks are supplied from a third pair of transformers.

Control of the 4.5-kv. feeder is from the substation at Broadway and Alder Streets. An oil switch on each leg of the feeder controls one pair of transformers and consequently

controls one north and south circuit. Through this control two sections in each direction are cut out at 1 a.m., leaving in service one circuit in each direction for all-night lights. This latter includes a pair of lamps, diagonally opposite, at each intersection, totaling 37 out of the 106 standards for all-night service.

Distribution from constant-current transformers to lamp standards is by



Fig. 1.—Portland's new lighting standard.

means of No. 8 solid, single-conductor armored parkway cable designed for service at 5 kv., 60 cycles. The cable enters the base of each lamp standard where it is controlled by a Westinghouse disconnecting pothead. From the pothead the connection is through a Westinghouse series transformer to the lamp. The series transformer changes the high-voltage 6.6-amp. current to 20-amp. at lower voltage. This transformer has 2 secondary windings, one for each lamp, and will operate satisfactorily even with both lamps out. Any standard may be disconnected from the circuit by means of the pothead without interrupting service to the remainder of the circuit.

The Broadway lighting system cost property owners about \$50,000 for installation. In addition to this the maintenance charge covering energy consumed, lamp renewals, cleaning and painting, replacements and other incidentals for a 5-year period will amount to about \$12 per month per standard.

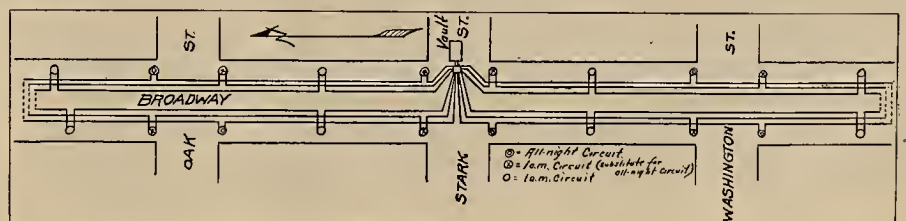


Fig. 2.—Schematic diagram indicating the single-vault circuit control for Portland's Broadway lighting system.

IDEAS FOR THE CONTRACTOR

Answering the Query, "Why So Many Switches?"

Based on Fundamentals of Power-Distribution Systems in Industrial Plants Using Central Station Power

"Why so many switches?" is the question invariably asked when the manager of an industrial plant looks at the wiring plans of a modern electrical layout. To begin with, the electrical layout of an industrial plant should be based on a careful study of the present and future requirements of installation. No two plants are identical, and different solutions of the problems presented are necessary. There is no attempt in this article to cover the entire field, but merely to point out a few fundamentals. A typical plant will be assumed of, say 50 to 500 hp., using 220-volt, 3-phase, 60-cycle power, with a rigid metal conduit system and standard fittings, externally operated safety switches, motor control apparatus, etc.

Referring to Fig. 1 as an example, an analysis will be made of the transmission of power from the power-company lines to the customer's 10-hp. motor. Note there are four switches in this layout—three fused switches and a motor control device. The function of each is as follows:

I. Main service switch—600 amp.

(a) Connects and disconnects power company to main switchboard. (b) Fuses protect power company and customer against hazards due to total plant overload and short circuits.

II. Branch switch—200 amp. (a) Connects and disconnects individual feeders without disturbing balance of plant. (b) Fuses protect bus from hazards due to total overload on sub-feeders and short circuits.

III. Circuit switch—60 amp. (a) Connects and disconnects individual motor circuit without disturbing balance of plant, permitting work on motor or motor control device. (b) Fuses protect sub-feed bus from hazards due to heavy sustained overloads or short circuits which cannot be handled by overload relay of motor control device. They will not open on usual motor starting currents.

IV. Motor control device—(a) Acts as motor controller for frequent operation—an inherent part of a complete motor equipment. (b) Provides running overload and under voltage protection to motor—the only switch giving true protection to the motor itself.

From this enumeration it readily may be seen that each switch has a definite and worth-while function to perform, and cannot in any sense be considered as unnecessary in any plant where safe and flexible electrical installation is desired. It should be noted in particular that a motor circuit always has at least three parts: (a) the circuit switch; (b) the motor control device, and (c) the motor.

Wiring viewed from this angle becomes a job for industrial electrical specialists—not an odd-moment task for a helper. It is a vital element in the operation and safety of the whole plant, and should represent an investment in proportion to its importance.

Why Two Codes?

(Contributed.)

Wherever the Uniform Electrical Ordinance has been presented, this question has been asked—Why Two Codes? Why does this ordinance contain the National Electrical Code and the National Electrical Safety Code? When it was decided to prepare a Uniform Electrical Ordinance, why were not the provisions of both these codes incorporated into a single code? Does not this situation entail needless complications?

While simplification is generally desirable, it is not always practicable, and this is the case with the two codes which govern electrical equipment and installation.

The National Electrical Code is a fire code. Its provisions and regulations have been drawn with the sole object of reducing fire hazard.

The National Electrical Safety Code is a casualty code and is designed primarily to reduce injury and loss of life to human beings.

Because of its character, the fire code admits of definite fixed rules, and inspections under it can be conducted by rigidly applying these rules.

The casualty code, on the other hand, admits of no such definition. A piece of electrical apparatus may be regarded as safe when placed in a given location, or so arranged that only expert electricians have access to it, but it may be considered highly hazardous when placed somewhere else, or accessible to the general public. Hence inspections under the casualty code must consider location and accessibility and must depend to a considerable extent on the judgment of the inspector.

For those reasons the two codes and inspections under them must be kept separate.

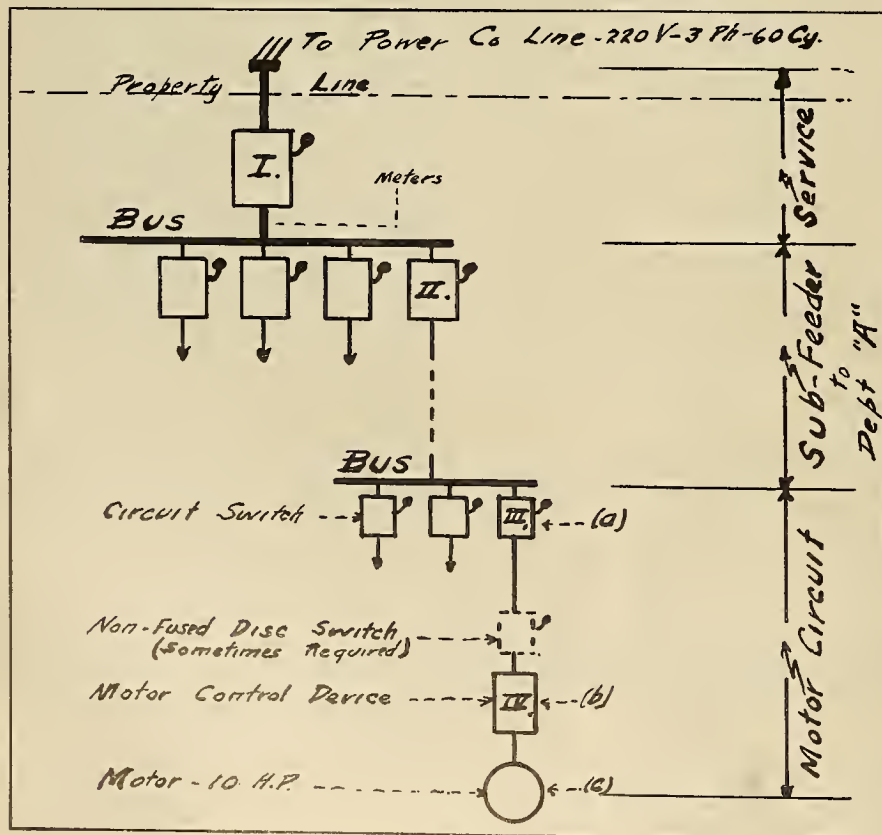


Fig. 1.

The National Electrical Code was drawn up originally in 1897 by the National Conference on Standard Electric Rules, a body composed of insurance, electrical, architectural and allied interests. Since the disbanding of this conference the code has been in charge of the National Fire Protection Association. The Association periodically revises the code to meet requirements of electrical progress, each revision being published by the National Board of Fire Underwriters and distributed to those interested and concerned with its application.

The National Electrical Safety Code was promulgated by the U. S. Bureau of Standards and first published in 1914. Its mission was to guide legislative bodies in preparing regulations covering public safety, especially with reference to workmen's compensation laws.

Nationalizing the Two Codes

When the Uniform Electrical Ordinance was prepared by the Electrical Manufacturers Council, the excellence of the two existing codes was recognized. It was planned to incorporate them bodily into the new ordinance, but certain limitations of the two codes prevented this. Before they could be made generally applicable, it was necessary to nationalize them and so draw them as to serve all affected interests—the public, the insurance companies, the builders, and the electrical industry as a whole.

This nationalization was effected by having the two codes approved by the American Engineering Standards Committee. The function of this committee is to see that all parties at interest have been represented properly in the preparation of proposed standards, and to signify, by its approval, that the proposed standards are fitted for nation-wide acceptance.

After revisions of both codes by their sponsors and after due investigation and consideration by various subcommittees and the American Engineering Standards Committee itself, both codes received formal approval and were inserted in the Uniform Electrical Ordinance.

Modifying the Codes

Through A.E.S.C. procedure provisions have been made for revision of these codes as the necessity arises. A revision of either code can be accomplished in about one year, the shortest time in which it is considered advisable that a change having such country-wide application should be made.

The State of Washington, W. B. Wilder, state architect, Olympia, will call for bids shortly for installation of electrically operated vote-recording machines and page calls for both house and senate chambers. The two installations will cost \$42,500.

The Electric Bulb & Appliance Company, 843 E. Washington Street, Pasadena, Calif., has been opened by D. W. Davis, formerly with the Southern California Edison Company of Los Angeles. In addition to merchandising appliances and radio, Mr. Davis will contract for wiring.

Electric Yacht Overhauled Using Unique Methods

When the auxiliary schooner yacht Guinevere, belonging to Edgar Palmer and carrying the pennant of the New York Yacht Club, tied up at the pier in San Diego, Calif., for overhauling of her diesel engines and electric motors and generators, several unique problems had to be solved by those co-operating in this work.

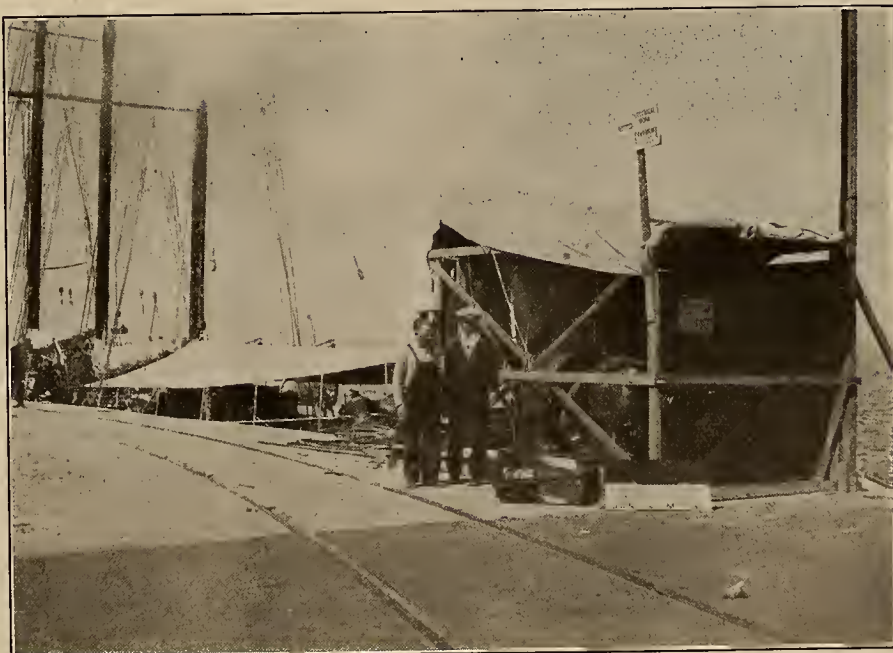
This boat is one of the first electrically equipped yachts and is the result of the engineering efforts of the Westinghouse Electric & Manufacturing Company, all engines, generators and motors having been especially designed. The yacht has 65 Westinghouse motors and generators on board. Everything is done by electricity from the cooking to the hoisting of the sails. The motor driving the propeller shaft is 550 hp. This motor is fed by two 350-hp. generators. Among its other equipment is a refrigeration system which was used for refrigerating over \$5,000 worth of meat and had to be kept in constant operation during the yacht's stay of eight days in port.

The overhauling was made possible by Joseph Brennan, San Diego harbor master, the San Diego Consolidated Gas & Electric Company and the California Electric Works. As direct current was necessary, a large motor-generator set was installed on the pier adjoining the boat, which supplied current not only to the refrigeration system but also for the charging of the boat's batteries, and for the complete lighting of the boat. This motor-generator set was kept in constant operation during the entire stay of the boat in port. All repair work was done under the supervision of the San Diego Marine Construction Company. The motor-generator set was furnished and installed by the California Electric Works, San Diego electragnists, who also had charge of the overhauling of generators and motors.

Red Seal Home Started in San Diego County.—San Diego County's first Red Seal electric home will be built for Mrs. W. L. McCormick at La Jolla Hermosa, according to E. W. Meise of the San Diego Consolidated Gas & Electric Company, who was instrumental in selling Mrs. McCormick the Red Seal idea. The home, which will cost in the neighborhood of \$40,000, was designed by Edgar V. Ullrich, La Jolla architect, and will be built by Henry Barker, La Jolla building contractor. The Messner Electric Company of La Jolla has been awarded the contract for the electrical work. The Red Seal Plan is applicable to all types of homes whether they are mansions or modest bungalows.



This unusual lighting fixture was installed in the summer home of C. C. Rivers of San Francisco in Manor, Marin County, Calif. The six sets of two-point deer horns were mounted on a solid brass band 21 in. in diameter by means of a running thread and a knob on each end. The fixture was manufactured by G. R. Maclaren, electragnist of Fairfax, using deer heads supplied by Mr. Rivers.



Motor-generator set installed on the pier adjacent to the electric yacht Guinevere to supply it with direct current for its refrigeration system, charging the batteries and lighting while the motors and generators were being overhauled.

Electric Cooking by New Cafe Builds Business

Restaurants and cafes are recognizing the advantages of electric cooking, and many of them have adopted this method exclusively. The greatly improved quality is perhaps the strongest appeal made by electric cooking. Cleanliness, convenience and simplicity of operation are important factors appreciated by the restaurateur.

An unusual installation has been made in the Sip-and-Bite lunch room in Fresno, Calif. This place has done



Convenience and simplicity are the dominating features of the electrically equipped Sip-and-Bite lunch room in Fresno.

an exceptionally good business since its opening, and the electric cooking has been the subject of considerable comment.

The electrical equipment includes: 3-kw. N-18 Hotpoint oven, 6-kw. 436-G3 Hotpoint griddle with a cooking surface 18x36 in., 2-kw. Westinghouse 2-unit full-automatic heavy-duty waffle iron, 2½-kw. L & H hotplate, 2½-kw. Strite toaster, 3 ten-cup Universal percolators, and 2 Everhot Junior 8 cookers. The steam table is heated electrically also with two 1,000-watt General Electric immersion units. A ceiling and desk fan also have been installed for the comfort of patrons. An electric water heater and air heaters are to be installed at a later date.

Chester Stewart is the owner and operator of the place. The electrical installation was made by the Valley Electrical Supply Company, which also sold the equipment.

Electragists Elected Officers of Newly Organized Santa Barbara Electrical Club.—H. L. Miller, electragist, has been elected president of the electrical club which has been organized in Santa Barbara, Calif. Perry Mortensen of the California Electric Company, also an electragist, is secretary-treasurer of the club. The club meets in the Rockwood Inn on alternate Tuesday nights. The meetings have been well attended and a great deal of interest has been manifested in the organization; there are forty members.

Parsons & Parsons, electrical dealers, Seattle, recently moved to a new location at 438 East 72d Street.

Cross Index for the Electrical Safety Orders—I

Cross-Reference Tables for Use with the Orders Issued by the Industrial Accident Commission of California

A cross-index for the Electrical Safety Orders of the Industrial Accident Commission of California has been prepared by E. Earl Browne, manager of the San Francisco Association of Electrical Contractors and

Dealers. This will be an aid to contractors, inspectors and others in the industry, for under any heading all of the references to that particular subject may be found. The first installment is presented herewith.

Subject	Order	Parts of other orders dealing with the same subject
CONDUCTORS—702		
Protecting Conductors from Excessive Current	702- 1(a)	714-1(c); 711-5(d); 711-6(a); 711-9(a)1; 707-4(i).
.....	702- 1(a)2	704-2(e); 704-7(b).
Voltage Limitations on Circuits for Lighting and Heating.....	702- 1(g)	707-7(a); 717-4(a).
Special 2-Wire 125-volt Circuits for Appliances and Devices.....	702- 1(h)	714-1(b).
Special 2-Wire 250-volt Circuits for Appliances and Devices.....	702- 1(j)	714-1(e).
Paralleling of Conductors.....	702- 1(p)	703-2(c); 710-4(b); 707-1(h); 711-5(g).
Carrying Capacity of Conductors.....	702- 1(q)	711-15(e); 713-8(b).
Demand Factor.....	702- 1(r)	707-5(b)4; 711-5(c).
Supporting Uninsulated Conductors and Copper Bus Bars.....	702- 1(s)	703-7(c).
Flexible Cords and Cables.....	702- 1(x)	713-4(b); 703-11(h); 717-4(f); 711-8(a)4; 704-4(a).
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WIRING METHODS—703		
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Size of Junction Boxes.....	703- 1(j)	703-7(c).
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Paralleling Conductors in Conduit.....	703- 2(c)	702-1(p).
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General Requirements.....	703- 7(e)	702-1(s); 703-1(j).
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Temporary Wiring.....	703-12(b)	703-10.
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GROUNDING—704		
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Grounding Noncurrent-carrying Metal Parts	704- 4(a)	711-8; 705-1(i); 717-4(k); 703-11(f); 702-1(x); 714-1(f).
Grounding or Guarding.....	704- 4(c)	703-1(m).
General Requirements.....	704- 5(b)	704-7(d).
Carrying Capacity of Grounding Conductor for Conduit, Cable Armor and Metal Raceways.....	704- 5(c)	704-2(f).
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Protection of Outgoing Feeders.....	705- 1(h)	707-9(d).
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Grounding Secondaries of Instrument Transformers	705- 1(k)	704-5(e).
Transformers in Buildings or Enclosures.....	705- 2(b)	714-2(d).

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Circuit Breaker Used as Service Switch or Cutout	707- 4(i)	710-1(a); 709-3(b); 709-1(a); 710-1(b).
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Additional Provisions and Requirements Applying to Bus Services.....	707- 5(b)	707-4(c); 702-1(r).
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Switches Not Required to Disconnect Certain Cutouts.....	709- 5(c)	709-2(f); 709-5(c); 710-4(c).
SWITCHBOARDS AND PANEL BOARDS—710		
Switchboards Operating at More than 300 Volts	710- 1(a)	707-4(i); 709-1(a).
Switchboards Operating at 300 Volts or Less	710- 1(b)	707-10(f)3; 705-1(j); 707-4(d); 715-2(a).
General Requirements.....	710- 2(a)	711-1(a).
Head Room.....	710- 2(b)	708-1(m).
Working Space Back of Switchboards and Control Panels.....	710- 2(c)	715-2(b).
Working Space in Front of Switchboards and Motor Control Panels.....	710- 2(d)	711-10(a).
Spacing of Switches and Cutouts.....	710- 4(b)	702-1(p).
Location of Switches and Fuses on Switchboards	710- 4(c)	709-5(c).
Protection of Live Parts.....	710- 5(a)	715-2(e); 709-5(a).
Switch Required to Disconnect Cutouts.....	710- 5(b)	709-5(b); 703-11(c); 709-5(a).

Questions and Answers on the Code and Safety Orders

Arrangements have been made with Claude W. Mitchell, electrical engineer of the Board of Fire Underwriters of the Pacific, to answer through the columns of the Journal of Electricity such questions on the National Electrical Code as are of general interest.

Similar arrangements have been made with George E. Kimball, electrical engineer of the Industrial Accident Commission of the State of California, to answer questions on the Electrical Safety Orders issued by the Commission.

While it is the object of this department to assist in a better understanding of the Code and the Safety Orders, replies given are not to be considered as official interpretations applying in all instances, as some of the rules permit of varying interpretations under different conditions. The questioner should be guided by the inspection department having jurisdiction.

All who are interested are invited to send in their inquiries regarding the National Electrical Code to Claude W. Mitchell, Board of Fire Underwriters of the Pacific, Merchants Exchange Building, San Francisco, Calif., or to the Editor, Journal of Electricity, 383 Mission Street, San Francisco. Questions on the Safety Orders should be sent to George E. Kimball, Industrial Accident Commission, State Building, Civic Center, San Francisco, or to the Editor.

Q. 8. Sign Cabinets. Does Order 716-3 (b) restricting the elevation of sign cabinets to 6 ft. above the roof on a working platform apply to hanging signs not more than 12 ft. above sidewalks?

A. Cabinets containing switches, clocks, flashers and similar equipment must be located where they will be safely accessible for repair and adjustment without the aid of a ladder. Where plug type cutouts for the branch circuits of the sign are placed within the sign, it is reasonably safe to permit them at an elevation of 12 ft. above the sidewalk. It would be no more hazardous under ordinary circumstances to renew plug fuses in the sign while standing on a ladder than it would be to renew lamps.

Q. 9. Is a switch required ahead of an ordinary type of push-button control small motor starting device using thermal relays or thermal cutouts?

A. Switches are required in most cases. These devices commonly use overload protective devices which are not approved for use without a fuse in series with them and switches are required directly ahead of such fuses. There are few switches which meet the requirement of Electrical Safety Order 711-9 (a) (2) by having "no parts alive when in the open position except the fixed incoming line studs or jaws." Several motor starting devices for small motors of 2 hp. and under which are not required to provide running overload protection or low-voltage release protection meet the requirement of the above order and a disconnecting switch for the motor-starting device is not required. The above answer is on the assumption that the branch circuit between the supply feeds and the motor-starting device requires no branch circuit fuse protection. See Electrical Safety Orders 711-5 (i) and 702-1 (l).

BETTER MERCHANDISING

If Summer Comes—Then Refrigerators

Most Advantageous Time for Electric Refrigeration Sales
Begins with Advent of Warmer Weather

Neither the equinoxes nor "The flowers that bloom in the spring" have anything to do with the case, as far as the electric refrigerator is concerned. Once a unit is installed in a home seasons may come and seasons may go, but the electric refrigerator stays on forever. This has been the experience of localities where electrical refrigeration has been in domestic use for two or three years now. Therefore it is not alone a seasonal load, by any means. The ice sign may be put away in the bookcase until next year when the first leaves begin to turn pink in autumn, and the old ice box be put in the garret or garage, but this never will happen to the electric refrigerator, once it gets in its effect on the habits of a family accustomed to its convenience.

Nevertheless, there is a logical time to push the sale of electric refrigeration above all other times, and that time is spring. For in spring the housewife's fancy lightly turns to thoughts of refrigeration, as warmer days come to affect foodstuffs in even the most perfect cooler which realtor can extol to the aspiring homeowner.

It is in spring that the last season's ice box is brought out of storage along with "hubbie's" last summer straw hat, both given the benefit of a renovation, and then foisted upon an innocent world as something brand new. And if there is no family heirloom in the shape of a refrigerator to trot out,

Why Electric Refrigeration?

These are the reasons why you would want electric refrigeration in your own home. Base your selling upon these facts:

Electric refrigerators:

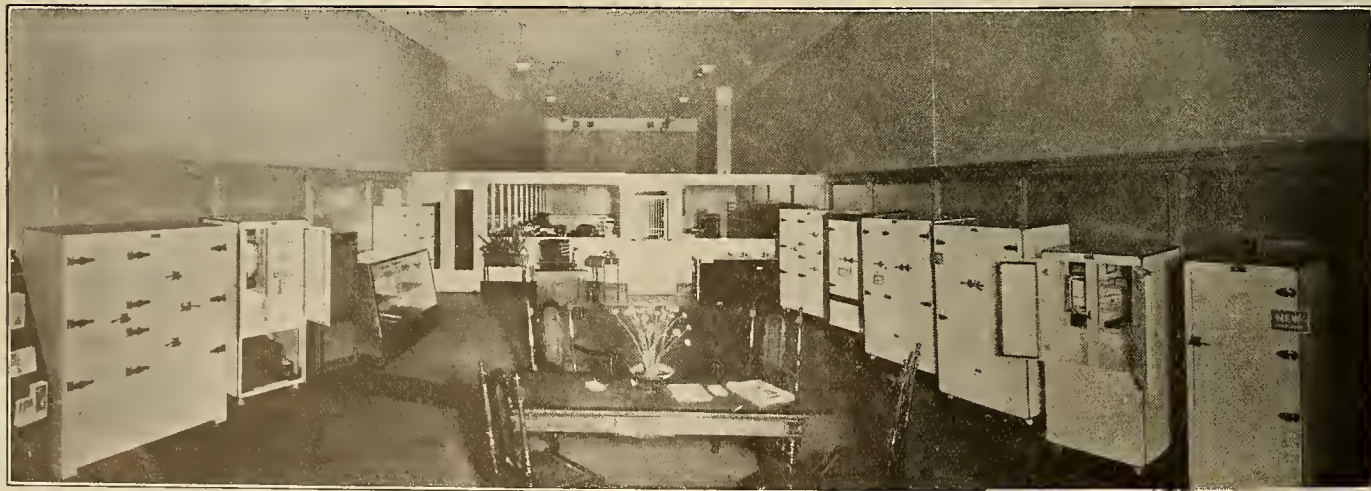
1. Eliminate all the fuss, mess, inconvenience, and dependence upon ice deliveries which housewives have had to contend with in greater or less degree.
2. Give the home the most modern of appliances for convenient and painless housekeeping. The electric refrigerator is something of which any home may be reasonably proud.
3. Keep foods always in their best condition, fresh, clean, cool, and appetizing, as well as healthful. Besides this they provide a means of making easily many tasteful frozen desserts which were impractical to consider making before.
4. Can be operated at a cost that at least compares favorably with the cost of ice and in most cases provide a real economy not only in operation and upkeep but in preservation of foods.

it is then that the furniture stores are visited furtively to procure a refrigerator for the summer months ahead.

This is the logical or, as the salesmen have it, the psychological moment for the sale of electric refrigeration. Moreover, if an electric refrigerator is sold in these spring months, it may be counted upon that by the time the usual autumn hibernation of ice boxes begins the family which has an electric refrigerator will not retire that efficient and handy servant for the winter on any pretext.

If This Be the Moment, Then—

Admitting spring as the logical season for refrigerator sales, it is well to admit also that spring alone will not sell refrigerators. There must be sales effort. And because electric refrigeration represents a new departure in many respects, there must be intelligent sales effort, intelligently applied. In this connection it is a commendable sign that the leading electric refrigerator manufacturers have felt that a co-operative effort to sell electric refrigeration is the only sensible plan, and are working together to these ends. They have established certain codes of sales ethics, the most noteworthy feature of which is to be found in the universal determination to sell collectively the idea of electric refrigeration, and not any particular refrigerator or in any way to engage in practices which will reflect discreditably



An attractive new sales and display room is that of Frigidaire in San Francisco

upon any make of refrigerator. No knocking of ice or ice men will be tolerated, either.

These be the things known as "what not to do." Added to them might be any of those other "not to do" things which good salesmanship has eliminated from modern practice.

Articles dealing with particular phases of selling electric refrigerators from the merchandising establishment standpoint appear in other columns of this issue. Each one points to some tangible treatment of the general sales problem. But it is of importance that the individual salesman's problems in selling electric refrigerators should be considered in the light of experience, too.

The broadside to the prospect prepares the way. Advertising in the newspapers lays the foundation for individual effort. Attractive display rooms and well planned demonstrations crystallize some of this preliminary sales effort. Yet, when all is said, these are the barrage which break down the resistance of the prospect. And it is important that those who go over the top and take the order home must be prepared to sweep aside the remaining obstacles by individual salesmanship.

What of the Salesman?

For the individual salesman selling refrigerators there are three major lines of action. They are:

1. Sell the machine on what it will do, and not on its mechanism.
2. Sell the convenience and cleanliness of electric refrigeration without knocking ice or ice men.
3. Sell the attractiveness and pride of ownership in an electric refrigerator.

One of the easiest things to do in selling electric apparatus to the average person interested at all in mechanics, is to talk too much machinery and not enough "what it will do" and "how well it will do it." The man who tinkers with the valve adjustment on his own car may want to hear all about the brine tank, and the refrigerant, and condensing coils. But the housewife is rare who cares a hoot about anything except what it will save her in food, trouble, dirt around the kitchen, and peace of mind.

If the refrigerator will make the home a better home, preserve foods and so safeguard her children's health, save her work and bother, and besides provide her with a facile means of preparing tempting frozen desserts, then she is interested in it. And the wise salesman dramatizes all these features in such a way as to make her feel herself actually cast in the role of owning one. When she gets a taste of the pleasure of that ownership in the way the refrigerator is presented to her, she never will be satisfied until she actually has one so that she can live the experience every day in her own home.

When the desire to own an electric refrigerator has been thoroughly aroused, then the prospect may demand to know how it all works. When that period is reached, a simple, non-technical explanation of the mechanical features of the plant will be in order. And even then, the stress should be laid upon those features of the mechanism which will make for a

long and useful life without bothersome servicing.

The convenience of electric refrigeration is a strong selling argument, but it is here that the nearest approach is made to dangerous ground. Convenience is largely a matter of superiority over ice, and each advantage of electric refrigeration over previous methods should be stated tactfully.

For instance, the housewife having an electric refrigerator may be shown that it will make her independent of ice deliveries; that it will not be necessary to bring ice into the kitchen; that the refrigerator may be placed to suit her own convenience without reference to its accessibility to icing; that it makes its own ice cubes in convenient size for every domestic use; and that she may buy foods with respect to market without fear of spoilage, for they may be kept indefinitely in an electric refrigerator which maintains a constant low temperature.

Beware of the Wily Germ

Food preservation by means of refrigeration isn't anything particularly new, and the public is acquainted pretty generally with the necessity from a sanitation standpoint for keeping foods at a low temperature. And yet one of the most effective arguments for electric refrigeration is in the fact that it not only provides low-temperature food preservation, but can maintain it better.

100,000 Broadside to Sell 2,200 Refrigerators

Edison Company Handling Four Makes Plans to Sell to its Range Customers Throughout Territory

With its list of electric-range customers as a preferred list of prospects the Southern California Edison Company has set itself the goal of 2,200 electric refrigerators for 1926. This quota, in the face of the fact that this company heretofore has sold no refrigerators, shows a faith in the future of electric refrigeration which is to be justified in the indications already evidenced by popular demand. With a program of this magnitude in view it will be of interest to others contemplating electric refrigeration sales to examine into the sales plan proposed by the Edison company.

Feeling that its territory presents a market of rich potentiality for refrigeration sales, the Southern California Edison Company, in its new merchandising program, determined first the extent of this market and also its likelihood as to salability for this particular appliance. With these factors in mind, a quota of 2,200 units was proposed, and sales plans designed to dispose of this large number of refrigerators were prepared.

It was decided by the Edison company that it would divide this quota among four makes of electric refrigerator, namely, the Kelvinator, Servel, Frigidaire and Electro-Kold. Only completely equipped cabinets are to be handled by the Edison company itself, provision being made whereby prospects desiring a refrigerator unit for an old ice box may be turned over to a dealer.

All refrigerators are to be sold at

Beware that the prospect is not scared to death by a lot of terrifying facts about disease germs breeding within the food in warm-room temperatures. Some life insurance may be sold by half scaring the prospect to death, whereupon he sees already a family in want and all that sort of thing. But fear-salesmanship more often than not reacts unfavorably and the victim of it resents the fact that he has submitted to panic. So while germs are germs, and electric refrigeration keeps them in their place, it is well in talking electric refrigerators to use more healthful means of bringing these conditions forth.

That may be accomplished best by tactfully giving the prospect credit for a full appreciation of the value of keeping foods clean and pure and free from contamination by correct refrigeration, and then showing how much better a job of temperature regulation is accomplished by the electric machine.

How Much Does it Cost to Run One?

The idea that electric refrigeration may cost more than other methods still holds, and yet investigations and tests have proved this to be untrue. But even supposing an electric refrigerator is placed where it must go on the lines at a high rate, the economies it will make in food preservation will make up for differences between the cost of ice and electricity.

the manufacturer's list price. Time payments are being arranged through an acceptance corporation whereby the purchaser may have six, twelve or eighteen months on varying types or grades of refrigerators.

An attractive plan also has been devised to induce contractor-builders who are building groups of homes or apartment houses to purchase the refrigerators on a discount basis, the same discount being allowed as that given to other refrigerator distributors in the territory. These discounts are to be based on the last refrigerator purchased, just as lamp and other quantity merchandise is discounted to dealers. That this plan is successful is to be seen in the fact that several blocks of machines already have been sold to contractors and builders for installation in new homes.

Using the electric-range customers as a preferred list of prospects, with the special advantage of being able to use electric refrigeration with an already lowered rate, a series of 50 broadsides is to be sent to each of these customers, as well as to other prospects considered likely purchasers. This will require 100,000 broadsides. Each of these broadsides is being prepared carefully as to advertising-copy appeal and attractiveness, the little trade character, "Busy Buttons," being used effectively to introduce the refrigerator's good points to the reader.

This campaign is directed not alone

to the housewives. Letters are being sent to the husbands as well, inviting them to see the displayed refrigerators at the nearest district office. It is hoped that in this way some of the sales resistance which usually accompanies selling only to one member of the household may be broken down. Following are texts of the two letters sent, one to husband, the other to wife:

Letter to Men

Mr. George Sheridan,
715 Orange Street,
Alhambra, California.
Dear Mr. Sheridan:

There is an electrical refrigerator in our office that we want you to see. Its beauty of design and simplicity of construction will appeal to you.

It is an appliance that sooner or later you will want in your home. That it may be sooner rather than later, a simple sales plan has been devised so that any Edison consumer can begin enjoying electrical refrigeration at once.

Drop in and ask questions. Look at the models on display. The women of the community already know about the many features of electrical refrigeration that no ice-box can supply, but we want the men to know them too. Hence this letter.

Will you come?

Cordially yours,

District Manager.

Letter Sent to Housewives

Mrs. Howard Little,
2142 Sunset Road,
Pasadena, California.
Dear Mrs. Little:

Electrical refrigeration—clean, cold and dry—is now within reach of all Edison consumers.

Standard makes of electrical refrigerators have been carefully studied and from them several types have been selected which we recommend and guarantee. You may see them at any of our offices.

The prices are reasonable. If desired, deferred payments may be arranged.

We have done all that we can to give you the kind of refrigerator you have wanted. Our representative will call in a few days and we are sure you will be interested in what he has to say.

Very truly yours,

District Manager.

To tie in with this publicity effort, extensive displays will be used in each of the district offices. Demonstrations will be staged, and newspaper advertising will be used freely. House-to-house canvassing is also in contemplation in certain instances.

To Co-operate With and Protect Dealers

Believing that there is a fundamental principle involved in the plan, the Edison company intends to further the efforts of the dealers in its territory to the fullest extent. It believes that it should not engage in unprofitable undertakings and to this end will protect the selling price of the machines so that the margin of profit shall be sufficient for dealer and company to cover all selling costs. This is based also on the idea that if the company does not make the sales pay their own way, certain of its customers will be bearing part of the selling cost for which they derive no direct benefit.

Denver Quota Set at 1,000 by Public Service Company

What is believed to be the most ambitious Western central-station refrigerator sales program, considering the size of the city served, is being

launched in April by the Public Service Company of Colorado, according to late word received from G. B. Buck, manager of the commercial electric department. Although delayed a bit in starting the campaign, the magnitude of the program was such that careful preparation had to be made for its auspicious launching.

The campaign started April 5 and is to continue during April and May, with a quota of 1,000 machines set for Denver alone. The bogey for the year is 3,000 machines. Although the present campaign is limited to the Servel machine, the company also merchandises the Frigidaire and General Electric machines, for which a later summer campaign is planned.

Extensive newspaper advertising announced the campaign in the last few days of March and the first days of April. Full page advertisements advised the public that the company was willing to place the machines on two weeks free trial. As a result 27 machines were placed the first day.

A sales organization for this campaign has been made up from the refrigeration, domestic electric, and radio sales staffs with the help of three factory men, making a total of 40 men to work the city, with teams of ten men in each of three districts of Denver. Special prizes have been offered for leading teams and captains.

An elaborate campaign manual also is being prepared for use throughout the company system. The campaign is in charge of G. B. Buck, who was also responsible for working out the details of the program.

Refrigerator Sales Plans Told by Western Agents

In response to an inquiry as to the sales plans contemplated by Western distributors of electric refrigerators, the following statements were received detailing the policies of several well known makes:

Frigidaire

A complete program, taking into account all outlets for their product, is contemplated by the Delco-Light Company, manufacturers of Frigidaire, according to W. L. Cochran in charge of the San Francisco sales branch. He says:

"In all of the cities as well as in provincial territories we have salesmen who devote all of their time and attention to selling of Frigidaire. They secure their prospects by a house-to-house canvass. Each salesman has his own particular territory to take care of.

"The Delco-Light Company will spend \$1,800,000 in 1926 for national and newspaper advertising. In addition to that we will use billboards and road signs, and, of course, exhibit our product at all state and county fairs, as well as industrial exhibits and food shows.

"In the smaller towns we tie up with some good electrical dealer, placing a Frigidaire in operation on his floor, and pay him a commission on all sales he makes and on leads he furnishes us which are closed by our salesmen.

"To the power companies who merchandise we sell direct, they furnishing their own sales crew. To those who do not merchandise we supply Frigidaire for installation in their various offices.

"Owing to the fact that the mechanical, or rather electrical, refrigerator load is constant, has no peak and is heaviest in summer time, it is a very desirable one for the power companies. They are giving us wonderful co-operation."

Copeland

Of the Copeland refrigerator system, Listenwaller & Gough, Pacific Coast distributors, have made the following brief statement:

"No effort will be made to sell Copeland systems direct to the public inasmuch as we have a dealer policy. A complete dealer co-operative plan has been developed embodying sales and service assistance of such character that it makes it a comparatively easy thing for a dealer to get into the business.

"For the present we are not presenting our system to the power companies but have an exclusive dealer set-up."

Zerozone

The Zerozone machine, manufactured by the Iron Mountain Company of Chicago, for which Ernest Ingold, Inc., is distributor in northern California, and Gilbert E. Foy in southern California, will be sold only to established dealers, according to the preliminary plans of the company. The distributors will handle the machine on a wholesale basis only. At the present 90 dealers have been lined up, each with an average of two machines, and more aggressive sales plans are to follow.

Servel

No direct selling of refrigerators to the public is to be done by the representatives of the Servel, according to a Coast distributor of this machine. Instead, a complete co-operative plan has been worked out whereby all outlets for the machine are to be given the benefit of manufacturers' advertising and sales force effort.

Demonstration units are to be placed with all dealers handling the machine; besides this many displays will be placed at fairs, in power company offices and wherever necessary to show the machine to advantage. An advertising program of great magnitude is being undertaken by The Servel Corporation in all leading national magazines and in newspapers. Extensive dealer helps, such as brochures and pamphlets in color, cards, and similar material, have been prepared.

Power companies which merchandise are sold the machines on the same plan as other dealers. This consists of a franchise arrangement similar to automobile selling by territories. Each dealer, whether power company or otherwise, makes all sales in his territory, the sales efforts of the Servel staff being given co-operatively to its dealers, they making no sales for Servel itself. House-to-house canvass for prospects or other legitimate means of getting prospects are to be employed in this dealer co-operation plan.

You Can Have SERVEL Refrigeration To-day

SERVEL is ready for your home to-day after many years of development by one of the country's largest manufacturers of domestic refrigerating apparatus. Backed by five years actual use in American homes, Servel now offers you immunity from refrigeration worries. No more waiting at home for the ice man. No more running out of ice over the week-end. No more spoiled food because the ice box would not maintain a low enough temperature. No more worrying for fear the ice will run out while you spend a day or so away from home.

SERVEL DOES ITS WORK SIMPLY
For Servel is ever at work. When the temperature rises above a certain point—which is much lower than the ice box ever attains—a simple automatic control starts the motor. Servel goes quietly to work. The temperature falls. The motor is automatically cut off. Servel uses electricity thriftily. It wastes none. And you will find that Servel works unobtrusively day after day, month in and month out. What a welcome relief from the old ice box.



SERVEL ELECTRIC REFRIGERATOR

Servel Electric Refrigerators are made in sizes to fit the needs of the smallest family to the largest establishment. They are available in a variety of styles and colors to match your kitchen decor. With its Servel refrigerator, you are furnished a complete kitchen outfit. "Good Housekeeping" magazine, containing your first recipe for Servel refrigerator, is yours when you have been originated and tested in Servel itself.

THE SERVEL COPY
A Servel unit of power also, the extra as used in Servel Electric Refrigerators, the Kelvinator, is now present in a few hours' time giving you Servel refrigeration at a minimum expense. In such instances the motor and compressor are installed in the basement or near the refrigerator.

SERVEL refrigerators are self-contained. The base houses the motor and compressor, the actual refrigerating unit is contained in one of the upper sections. If you have a good ice box and wish to keep it, you can still have Servel refrigeration. For Servel refrigerating units are made that fit right into the ice compartment of the old-fashioned ice box. In such cases the motor and compressor are installed in the basement, or near the refrigerator. But no matter what style you choose you are assured of modern refrigeration.

FREE TRIAL IN YOUR OWN HOME
Just as candles gave way to electric sad-irons to electric irons, clothes boiler electric washing machines, and broom vacuum cleaners, the old ice box is going to bow to electric refrigeration. Servel refrigeration. And you can have Servel refrigeration right away. Servel is offered to you on a free trial, in your own home. If you like it, and you will, convenient terms may be arranged for payment. Have the postman pick up the card today.

SERVEL ALSO SOLD AND ENDORSED BY
PARMELEE, COHNSMANN
H. L. MILLER
and other Electric Appliance Dealers

At The Modern (Electric) Kitchen Now Open from 9 a. m. to 5:30 p. m. Daily



The KELVIN-ET Kelvinator, with Refrigerator, Complete

Here, at last, is Kelvinator Electric Refrigeration for the person living in a small house or apartment. It is the new Kelvin-et.

The low price, \$280.00, includes both Kelvinator and refrigerator. Every part is enclosed in the refrigerator. It can be set in place like any article of furniture and the only connection required is "plugging in" as you would an electric iron.

The interior of the Kelvin-et stays many degrees colder than that of the best ice-cooled refrigerator. It operates automatically, requires no attention and relieves you of the worry and trouble of ice delivery. You will find it not only a time saver but an economy as well, for its costs less to operate it than to buy ice.

You can have a Kelvin-et installed in your home and pay for it on your own terms.

The first time you are downtown make it a point to drop in at our store and see the Kelvin-et in full operation in our Modern Electric Kitchen.

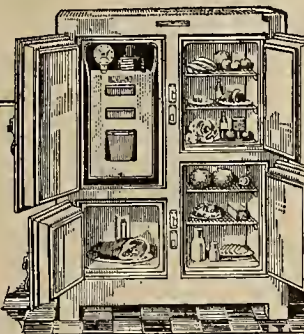


BOISE 824 Main St. 2—Stores—2 Nampa 1306 First St. S.

KELVINATOR

The Oldest Domestic Electric Refrigeration

See the Kelvinator at the Modern (Electric) Kitchen



Chill Your Refrigerator With Electricity

Put Kelvinator electric refrigeration in your present refrigerator and you can forget refrigeration problems. Kelvinator never melts, requires no attention and never needs recharging. It will keep your refrigerator many degrees colder than ice does. More than that, it will keep it free from moisture. This dry, intense cold not only keeps foods fresh for days but actually improves them.

With Kelvinator you still have a clear view of it in the freezing unit. Ice, when desired, can be frozen trays. It costs less to own a Kelvinator than to own a box to buy ice. You can be installed in your home at your own terms.

The first time you are downtown make it a point to drop in at our store and see the Kelvin-et in full operation in our Modern Electric Kitchen.



BOISE 824 Main St. 2—Stores—2 Nampa 1306 First St. S.

For Every Home According to Its



This Company takes in your old ice box. The Edison Company will buy your old ice box from you, if so desired. Or, if you have a good ice box, arrangements can be made to install an electric refrigerator unit in the basement.

Whatever size home you have, you can enjoy electrical refrigeration. There is a size refrigerator to suit the requirements and the purse of every family.



Come and look them over at any office of the

EDISON COMPANY

Small Monthly Payments. Small monthly payments arranged so that you can enjoy the many benefits brought into the Electrical Refrigerator.



"Of course—the housewife who learns how the **ELECTRIC REFRIGERATOR** works will want one"

Your friend Busy Buttons has been looking into the merits of the Electric Refrigerator and he is anxious to share the good news with you.

For Electric Refrigerators work wonders in the kitchen. They bring new dainties and delicacies within your reach; save unbelievable quantities of food; protect your health; and cost little to operate.

Busy Buttons will bring you this wonderful convenience in a surprising manner. He is prepared to place it in your home on such terms that it will begin to pay for itself from the time it starts to serve you.

This may sound too good—but it is true.

[The plan is very easy]

Candles and Ice Belong to Another Age



CANDLE-LIGHT seemed satisfactory when candles were the only means of illumination available.

The ice box seemed satisfactory only because candles too were the only means of refrigeration available!

But both were makeshift!



Electric illumination makes the candle inefficient and unsatisfactory. Servel Electric Refrigeration makes the ice box even more inefficient and unsatisfactory.

Electricity and with "Servel" ideal electric refrigeration comes into your home!

The Service Company, which has the wonderful and efficient Servel Electric Refrigeration, makes possible economical electric method of "SERVEL" refrigeration.

Power subjecting in advantage to the advantage of electric light, has never been investigated. It is purchased on such liberal terms that it is practically pay for itself in a few years.

Production of it!

SERVEL WIRE

Servel may also be installed in your own refrigerator at reasonable cost.

Those attending the Facts Free Electric Cooking School are cordially invited to inspect the

Servel Electric Refrigerator

which Miss Galvin is using this week. She will be very glad to explain its operation.

FOR SALE BY

Southern California Edison Company

ELECTRIC REFRIGERATOR COMPRESSOR DIRECTORY

Published and Copyrighted by Journal of Electricity, October 15, 1925

A list of domestic electric refrigerator compressors giving catalog information on this equipment of each, with complete list of Western Distributing Agencies where repair parts may be secured. The publisher does not guarantee this information, but to the best of our knowledge it is correct at date of publication. When referring to this list in any way, mention the Journal of Electricity.

Lid-Leland DFM—Dayton Fan & Motor Co. WE—Western Electric																	
Name of Manufacturer	Trade Name	Model or Catalog No.	Control	Refrigerant	Compressor	Motor		Drive	Dimensions (Inches)	Weight (Lbs.)	Maximum Capacities			Retail Prices Maximum and Minimum West of Rockies*	Western Sales Representative	Western Distributors	Nearest Point at which Repair Parts may be Secured
						H.P.	Cooling				Food (cu. ft.)	Melting (lb. per 24 hr.)	Ice (lb. per 24 hr.)				
American Electric Corporation, 46 E. 20th St., N. Y.	Electric	A B	Therm Therm	Sulphur-Dioxide	Air	1/4	Em Wag Cent	Direct	.....	36 36	5 1/2	110	5	\$260 to \$295 plus freight	None	California Refrigeration Co., 2005 San Fernando Road Los Angeles, Calif.	Los Angeles
California Refrigeration Co., 2005 San Fernando Road Los Angeles, Calif.				Sulphur-Dioxide		1/8			14 1/2 x 25 x 23 1/2	110	40	7	2 1/2 to 3	\$250 to \$425 plus installation	E. B. Wilson 8375 Fountain Ave. Hollywood, Calif.	Los Angeles	
Copeland Products, Inc., Detroit, Mich.	Copeland Refrigerating Systems	E	Therm	Iso-Butane (Freon)	Air	1/6	DFM	V-belt	18 1/2 x 23 1/2 x 19 1/2	191	10	3.6	7 1/2	\$190 plus freight and installation to \$320 plus freight and installation to \$340	J. A. Harlan, Sales Mgr. Dayton, Ohio	Delco Light Co., 1525 16th St. Denver Delco Light Co., 871 Mission St., San Francisco Delco Light Co., 1313 W. 7th St., Los Angeles Modern Appliances Co., 1612 2nd Ave., Seattle Indus. Lt. & Power Co., 134 E. 2nd St., Salt Lake	Distributors or dealers
Delco Light Co., Dayton, Ohio	Frigidaire	1 cyl. A.C. 2 cyl. A.C. 2 cyl. W.C.	Aut. Low Pressure	Sulphur-Dioxide	Air	1/4	Cent Wag Em	Belt	18 1/2 x 23 1/2 x 19 1/2	216	35	7.1	17	\$238 to \$340 plus freight and installation			Los Angeles
Electro-Kold Corporation, Spokane, Wash.	Electro-Kold	A C F	Merc. Therm " "	Sulphur-Dioxide	Air	1/2 1/4 1/4	Cent GE	Belt	42 1/2 x 20 x 28 24 x 18 x 20 30 x 18 x 22 1/2	225 142 147	60 10 15	..... 12 15	18 12 15	\$230 to \$385 " " " "	Dealers Appointed in West		At all dealers
General Electric Company, Schenectady, N.Y.	GE Refrigerator	OC-2 Form 1	Therm	Sulphur-Dioxide	Air	1/6	GE	Direct	32 high 18 dia.	200	9	4-1/6	7	\$550 to \$675	General Electric in all large cities.		Any General Electric office.
General Refrigeration Company, Beloit, Wis.	Lipman	25 50	Therm	Ammonia	Water	1/4	GE	Belt	29 1/2 x 16-9/16 x 23	450	.....	10-5/6	.....	\$450 average	C. Sowers	Gray, McLean & Percy, Seattle, Portland Price, Teitz Co., San Francisco General Ref. Co. of Calif., Los Angeles West Coast Gas Eng. Co., San Diego The Daily Co., Denver Automatic Ref. Co., Salt Lake	
Iron Mountain Co., Chicago, Ill.	Zerozone	C5 C15 C20	Merc. Sw.	Sulphur-Dioxide	Air	1/4	Cent	Belt	.....	.....	5-30	.....	.....	\$210 to \$275 F.O.B.	Ernest Ingold, Inc., 850 Van Ness Ave., San Francisco	Gilbert E. Foy, 1027 Loeve State Bldg., Los Angeles	
The Isko Company, 2525 Clybourn Ave. Chicago, Ill.	Isko	20 200	Therm-Aut " "	Sulphur-Dioxide	Water	1/4 3	Cent Em GE	Direct	36 x 9 x 16 60 x 24 x 18	100 120	40 1400	200 135	120 7 1/2	\$300 to \$400 \$395 to \$800 \$895 to \$1495	A. C. Beckman, Missoula, Mont. R. L. Henderson, Omaha		
Kelvinator Corporation, 2072 W. Fort St., Detroit, Mich.	Kelvinator Electric Refrigeration	Jr-1 cyl Sr-2 cyl	Therm " "	Sulphur-Dioxide	Air	1/4	Wag Cent Em	Belt	30 1/2 x 17 x 26 1/2 30 1/2 x 17 x 24 1/2	160 140	70 20	225 135	15 1/2 7 1/2	.....	L. D. Robertson 1522 W. 7th St. Los Angeles	Lee, J. Meyberg Co., 972 Mission St., San Francisco	
Refrigo Corporation, 18th & Forest Aves., Milwaukee, Wis.	Refrigo	.....	Merc Therm	Ammonia		1/4	Cent WE	Belt	18 x 24 x 22	185	.....	.....	.....	.....
Servel Corporation, 510 N. Dearborn St., Chicago	Serv-el	No. 1 2 4 5 8 51	Press Therm " " " " " " " "	Methyl Chloride " " " "		1/4	Cent " " " " " "	Belt	.....	300	.....	.....	60 to 80 to 96 to 100	\$295 to \$700	Servel Corporation 809 So. Los Angeles St., Los Angeles	District Offices at 447 Sutter St., San Francisco; 1833 5th Ave., Seattle; Gas & Elect. Bldg., Denver.	Evansville, Ind., Emergency Stock, Los Angeles.
Superior Refrigeration, Inc., Lima, Ohio	Superior	5 12 32	Merc Therm " "	Sulphur-Dioxide	Air	1/4 1/4	Cent Lid	Belt	19 x 21 x 27 " "	180 250 270	7 1/2 15-30 35-45	5-5/24 10-5/12 14-7/12	36 100 108	.....			Omaha
Universe Corporation, 77 W. Washington St., Chicago, Ill.	Polaris	Kitchenette Appt. Spec. Ideal	Therm	Sulphur-Dioxide		1/4	DFM	Belt	19 x 24 x 17 1/2	300	.....	.....	.....	\$350 F.O.B. factory \$400 F.O.B. factory \$475 F.O.B. factory			

NEWS OF THE INDUSTRY

Oversubscribe First B. C. Electric Railway Customer Stock in Five Days

Phenomenal success in inaugurating a customer-ownership policy was achieved by the British Columbia Electric Railway Company recently when the public of Vancouver and Victoria applied for more than \$7,000,000 of 6 per cent cumulative preference shares of the British Columbia Electric Power & Gas Company, a subsidiary, in five and a half days between March 15 and 20. The amount offered for sale was only \$2,250,000, of which \$1,500,000 was underwritten by a syndicate of local bond dealers and the remaining \$750,000 allotted to employees to buy themselves or sell.

The employees of the company brought in no less than 10,851 applications for a total of \$5,625,300, although the bond dealers sold their allotment at the same time. The employees' portion therefore was oversubscribed more than seven times. As the entire issue authorized was \$5,000,000, more than \$2,000,000 in applications will be refused.

The population of the territory served being only 350,000, this is believed to be a record, at least for a first customer-ownership campaign. Applications were limited to fifty shares and none were admitted from other than residents of the province of British Columbia.

It is believed that another record was made in the number of employee applications for shares. Out of a total of 2,985 permanent employees, including railway, power and gas departments, 1,410 applied for a total of \$602,000. This amount is more than two-thirds of the employees' allotment. More than 47 per cent of all employees are now shareholders. Shares were sold to the public at 99.

As already has been announced (Journal of Electricity, March 15, p. 235), the B.C. Electric Power & Gas Company was incorporated to make customer-ownership possible. The railway company is an English company and its dividends or interest payments are subject to English income tax, which makes the ownership of its shares or stock in Canada not feasible. This, therefore, was the first effort towards customer-ownership by the B.C. Electric Railway Company or any of its subsidiaries.

It originally was planned to open the sale on March 20, although incorporation of the new company was accomplished only on March 4. Knowledge of the incorporation and its purpose having spread, without any direct publicity campaign being started, there arose such a demand for stock that it was impossible to hold back the

sale. Employees and brokers therefore were allowed to take applications on March 15, in spite of the fact that the main advertising of the campaign could not be advanced more than two days or to March 17.

The brokers' allotment was sold entirely in two days and the employee allotment practically in twenty-four hours. When the advertising began to be felt on the third day of the sale, applications double, pouring in that day to the extent of no less than \$1,200,000.

In the official prospectus March 31 was named as the date for the closing of subscription lists. When oversubscription was seen to be inevitable, this date was advanced to March 20 and employees were requested to solicit no new applications. Advertising was discontinued, a great deal of material, including car cards, posters and newspaper advertisements, being discarded unused. In spite of this, applications continued to pour into the company's offices. Employees were requested by their friends to try to have applications accepted. Begging letters were received even after the close of the campaign asking the company as a favor to sell the customer some shares. It was less a case of selling shares than taking orders.

Some of the figures concerning the campaign are interesting. The city of Victoria with a population of some 50,000 applied through employees for more than \$1,000,000, or more than the entire employee allotment. One department of the head office, the accounting department, with 187 employees, sold \$700,000 worth of shares or almost the entire original employees' allotment. Three hundred

motormen and conductors on Vancouver city lines applied for \$132,700 worth of shares themselves. This department also made 959 public sales amounting to \$458,800.

Local newspaper comment declared that the oversubscription was an indication of the confidence in the integrity of the company. It was pointed out that no such public subscription had been received since the Victory loans of 1917, 1918 and 1919. It is believed that the offering was the largest ever made by a Canadian company through the medium of a customer-ownership campaign, and the oversubscription of this offering therefore creates a double record.

All previous financing by the British Columbia Electric Railway Company and its subsidiaries has been done in England. The president of the company is George Kidd and the head office is in Vancouver. The customer-ownership campaign was in charge of William Saville, general secretary, E. H. Adams, comptroller, and James Lightbody, publicity manager.

Modern Telegraphic Service for Mexico Arranged For

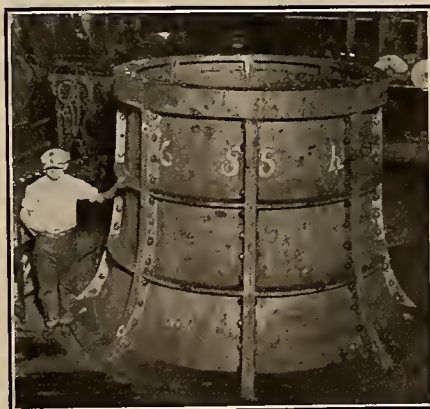
Subject to the approval of President Calles of Mexico a contract has been concluded between the Western Union Telegraph Company, the Mexican Telegraph Company and the Mexican government whereby modern telegraphic service will be introduced into Mexico. The arrangement includes the extension to international traffic of night-letter, day-letter, night-message and money-transfer service.

This direct service to Mexico will be extended to sister republics south through All-America Cables.

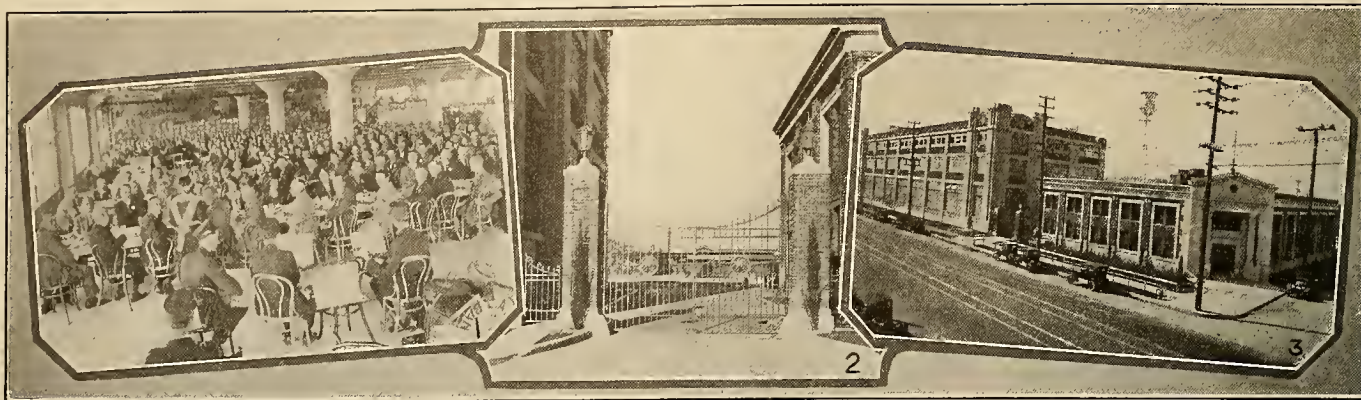
Ten-Ton Draft Tube Liner Built for Edison Company

To replace the worn steel liner of a large concrete draft tube in power house No. 8 of the Big Creek-San Joaquin system of the Southern California Edison Company, the Baker Iron Works of Los Angeles shipped a draft tube liner the latter part of January made of cast iron weighing 10 tons and capable of sustaining a pressure of 1,000 lb. to the square inch. In placing the order for this liner with the iron works the engineers of the Southern California Edison Company presented a problem requiring exceptional exactness in casting and machining.

The liner was cast in eight sections for greater convenience in shipping. It was required that these sections be assembled with absolutely close joints and the whole liner inserted in the draft tube opening which exactly fits it.



Ten-ton draft tube liner built by Baker Iron Works for the Southern California Edison Company.



When is a warehouse not a warehouse? The answer is to be found in the occasion of the Los Angeles Electric Club's visit, en masse, to the new General Electric Company warehouse and offices, when these same buildings became a large banquet hall. Left—the club assembled to partake of the G. E. fare. Center—the ornamental gateway to the new yards. Right—the two buildings as they appear finished.

General Electric Entertains Club in New Quarters

More than 400 members of the Electric Club of Los Angeles were guests of the General Electric Company at a luncheon given in the company's new Los Angeles quarters March 22. The luncheon, arranged by S. E. Gates, president of the club and general manager of the General Electric Company, Los Angeles, was served on the third floor of the new warehouse. One end of this floor was cleared off, and temporary tables set up at which the guests were seated. A temporary kitchen was set up also.

Talks on the tremendous increase in the use of electricity during the past decade featured the program. Henry M. Robinson, president of the First National Bank of Los Angeles, as the principal speaker, gave some interesting statistics portraying this growth. He pointed out that in the field of agriculture alone more than 850,000,000 kw.-hr. of electrical energy are being used annually and that of this vast amount of energy more than 60 per cent is consumed in California. He further stated that estimates now placed the number of people who are connected in some way with the electrical industry in the United States in excess of 6,000,000. Other speakers were M. P. Rice, manager of publications in the General Electric main office at Schenectady, and George Emmons, ex-vice-president of the General Electric Company.

Following the luncheon the entire gathering enjoyed a personally conducted tour of the fine new offices, warehouse and service shop of the host.

Great Western Power Company to Lay Fifth Bay Cable

Increased business has made necessary important additions to the San Francisco system of the Great Western Power Company of California that will involve an expenditure of \$1,200,000 during the next few months, according to L. M. Hardie, local division manager. The additions will include the laying of the company's fifth bay cable, construction of a power transmission line from San Francisco to Half Moon Bay (*Journal of Electricity*, Jan. 1, p. 30), and the building of two new substations on this line.

The submarine cable will bring an additional 15,000 hp. of electric energy into San Francisco at a cost of approximately \$332,000. It will be laid between a point near Richmond and Pier 39 on the San Francisco shore, a distance of 40,000 ft., establishing a new record as the longest high-voltage cable of its capacity ever laid. It will exceed by more than 2,000 ft. the length of Bay cable No. 4, installed in January, 1923, between Brooks Island and San Francisco. The new cable will be similar in construction, consisting of three 500,000 circ. mil copper conductors with shore ends of 750,000 circ. mil copper. The diameter of the cable will be 4¼ in., the conductors insulated with rubber and surrounded with an impregnated filling. Heavy armor wires will protect the whole from external injury.

Electron-Physics Discussed for San Francisco Engineers

Proving himself to be a great human as well as one of the foremost scientists of the present generation, Dr. Michael I. Pupin, president of the American Institute of Electrical Engineers, addressed a capacity audience in the auditorium of the Pacific Gas and Electric Building, San Francisco, on the evening of March 26.

Dr. Pupin was able to paint so beautiful a picture of his conception of the electron theory of physics that he carried his audience along with him, almost breathless. Tracing briefly the historical highlights of experiments, developments and discoveries that have led up to the present firm establishment of the modern conception of electron-physics, the speaker digressed interestingly to discuss the personal characteristics of the scientists and inventors whose life works have been valuable contributions toward a modern and a correct understanding of the subject.

Chief among the many statements of Dr. Pupin were those to the effect that all energy is due to electrons in motion and that the mass of all bodies is dependent upon their electronic content. Thus the popular conception of electricity seems due to be changed from that of a force with which street cars and factories are run to that of a force that is the vital, controlling factor of the universe.

New Colorado Corporation Takes Over Four Electric Plants

Another answer to the undesirability of developing hydroelectric power possibilities in mountain regions where coal is available is given in the recent action of Troy, Graham & Company, Chicago bankers, in purchasing a number of privately owned electric companies in northwestern Colorado and organizing them into the Colorado Utilities Corporation.

The electric plants at Craig, Hayden, Oak Creek and Steamboat Springs have been purchased and a large central generating plant of 30,000-kw. initial capacity will be built at Mount Harris, the biggest coal center of the region, to replace the individual steam generating units. The preliminary investment is understood to be about \$500,000.

The company has been incorporated in Denver with Douglas Graham, S. A. Graham and L. J. Knauf as organizers and Irving W. Durfee of Chicago handling the legal details. While Troy Graham & Company, backers of this proposition, have operated a number of smaller utility chains in the Middle West this is their initial entry in the Mountain region.

New Warehouse to Be Built by Edison Company at Lindsay

Work is to begin immediately on a new \$36,000 warehouse and garage to take care of the needs of the Lindsay territory of the Southern California Edison Company. This warehouse and garage, which is to be a one-story structure, 95 ft. x 105 ft., is to be located at the corner of Tulare Street and Blue Gum Avenue. It will have reinforced concrete floors and reinforced concrete walls up to window height, then structural steel frame with steel sash and corrugated iron siding and roof. Present plans call for the completion of this structure about July 1. In keeping with the company's general policy, the grounds will be laid out with lawn and shrubs.

This warehouse is but one of thirty-four similar establishments which serve as contact points for the tremendous and highly involved general store system, which must be maintained by the Edison company to meet the demands put upon it by the rapid growth of the communities in which it operates.

High Line Completed Through City by Portland Company

Connecting its principal steam plant with its main receiving station for hydro power in the city of Portland, supplementing the low-tension ties already existing, the Northwestern Electric Company recently has completed a 66,000-volt tie line through the city. The line, approximately five miles in length, runs from the Albina substation on the east side generally south through residential and business districts to a point on the Willamette River opposite the lower end of Ross Island, where it crosses the river on two long spans, thence doubling back on the west side to the Lincoln Street steam plant.

The lead, which is of single wood poles averaging seventy-five feet in length, is designed to carry a possible two circuits, though at the present time only one is installed. Conductors are 336,400 circ.-mil., standard aluminum, steel-cored cables, giving a capacity of 30,000 kva. to the circuit. Pin-type insulators are used throughout except at strain points, where five-unit suspension insulators are used, and on the river crossing where the suspension insulators contain seven units.

The river crossing is supported by three steel towers, a dead-end tower on each shore and a supporting tower on Ross Island near the center of the crossing. On the supporting tower the conductors are suspended on a movable trolley device to permit them to roll free. The east strain tower is 107 ft. high and the other two are 175 ft. high. This provides a minimum vertical clearance of the conductors above low water of 123 ft., as required by the war department. The east span is 1,052 ft., and the west span, 1,133 ft. long. The line, exclusive of switching and transformation equipment at either end, cost about \$155,000.

Chelan Electric Company Starts Work on Power Station

Actual construction work has begun on the Chelan power station for The Washington Water Power Company, which is arranging to take over the Chelan Electric Company in whose name the development is being made. (Journal of Electricity, Oct. 1, 1925, p. 263.) Grant Smith & Company, who have charge of the construction, are working on a schedule which calls for the first installation of equipment for about 35,000 hp. in 1927. An ultimate installation of about 125,000 hp. is provided in the Chelan plans.

The permit granted by the Federal Power Commission to the Chelan Electric Company, which is a subsidiary of the Great Northern Railway Company, contains several unusual features. The Chelan station must be interconnected with The Washington Water Power Company's transmission system, giving the six present stations of The Washington Water Power Company on the Spokane River the bulk of the summer load. This is provided in order to permit the Lake Chelan reservoir to be at a high level during the tourist recreation season at the lake.

A dam will be constructed near the mouth of Lake Chelan, and tunnels will be built to the station four miles

below where the short Chelan River empties into the Columbia River. The permit specifies that the lake reservoir may be raised 7 ft. above the normal high water level of the river but may not be lowered then more than 4 ft. in the tourist season until after Aug. 15 when a heavy irrigation pumping load is anticipated. It is estimated that the raise of the lake 7 ft. will provide an additional storage of 200,000 acre-ft., and that between the maximum and minimum levels provided about 680,000 acre-ft. of water will be available.

Running at full capacity the station may use 2,000 ft. of water except that between April 1 and Aug. 15 only 1,000 ft. may be used unless the lake is within 4 ft. of maximum high water. A 4-ft. fluctuation is allowed during the summer months, although it is expected that not more than 3 ft. will be used in average seasons. No limit is set on the rate water is drawn off after Aug. 15, provided the minimum level is not passed.

Preliminary Work Started on Mokelumne River Project

Preliminary construction work has been started by the Pacific Gas and Electric Company on its Mokelumne River project. (Journal of Electricity, Feb. 15, p. 157.) Crews of men are moving in for the construction of approximately fifty miles of power line from the Electra power house located near Jackson, Calif., to the Salt Springs dam site. This line will serve temporary power for the construction work. Twenty-five miles of road are to be built, taking in part of the old road running into Tiger Creek Mill site.

The Mokelumne River development involves the construction of a 213-ft. dam on that river at Salt Springs, approximately four miles upstream from the junction of the Mokelumne with its principal tributary, the Bear River. The water impounded will create a reservoir of 60,000 acre-ft. capacity. From an intake at the dam the water will be conveyed by a concrete-lined canal and tunnel for a distance of 25 miles to Tiger Creek. At this point the water will be dropped 1,200 ft. through penstocks to operate a new power house with an installed capacity of 47,000 hp. The water will be carried from the Tiger Creek power house to the company's Electra power house where it will be used further for the generation of electric energy, increasing the output of the Electra power house which has now an installed capacity of 26,810 hp.

Bondholders Dispose of Steam Plant Formerly Part of Colorado Springs Light, Heat & Power Company's System.—The bondholders of the Colorado Springs Light, Heat & Power Company whose electric plants and lines were taken over for operation by the municipality (Journal of Electricity, June 15, 1925, p. 597), have disposed of the steam plant left on their hands. It has been sold to W. A. Otis, formerly president of W. A. Otis & Company, who in association with Charles Sutton of Colorado will equip the plant for the manufacture of special hard steel for high-speed tools.

Southern Sierras Company to Add to San Bernardino Plant

Construction is to start at once on a \$500,000 addition to the San Bernardino plant of The Southern Sierras Power Company, between Mill street and the Santa Fe tracks.

The new building will house a new 15,000-kva. condenser, and will provide space for a second condenser of the same capacity. It will be of steel frame, reinforced concrete, with a ground area 60 ft. by 75 ft., 40 ft. high, with a longitudinal basement half the width of the building. One-half will be occupied by the big condenser and overhead crane; the other half, separated from the condenser room by a partition running lengthwise of the building, will contain the basement into which the cables will run; ground floor, oil circuit breakers; second floor, bus and conduit room; third floor, operating room.

The new condenser unit is the fore-runner of others to follow, the last wall of the building housing it being of semi-temporary construction to facilitate future expansion. Besides the condenser other equipment ordered for this location includes three 5,000-kva. transformers to furnish increased transformer capacity for the Imperial Valley line, and three other 5,000-kva. transformers to supply the synchronous condenser; new high-tension bus structure which ultimately will supplant that at present in use, and a new bus structure for the 88,000-volt service for the Imperial Valley line.

Ellensburg, Wash., Considers Puget Sound Company Offer

The city of Ellensburg, Wash., is considering a proposition from the Puget Sound Power & Light Company to supply the needed power for the municipal power plant at a figure which it is claimed would cost the city less than to provide power by the installation of Diesel engine equipment. The proposition was informal and comprised three suggestions. One was that the company furnish the amount of power the city would require and to make installations of line and substations to supply the city for \$1.25 a horsepower per month plus a graduated rate per kilowatt, starting at nine mills and graduated down to six and a quarter mills on contract for ten years, with the provision permitting the city to cancel it in five years.

A second proposition was for the power company to pay the city a flat amount for a lease on the municipal system on the basis of its net revenue and to furnish power for pumping at its present cost, the company to give the city the option of canceling the lease at any time there was any increase in rate. The company also agreed to give the consumers an immediate reduction of 10 per cent in lighting rates.

The third plan offered was for the company to purchase the plant, the company agreeing to do that at any time the city so desires, if the city in the meantime leases the plant to the company. Under the purchase agreement the power company agreed to reduce the lighting rates 16 per cent, the price to be agreed upon at time of purchase. The city has taken all three propositions under consideration.

Two Construction Projects on Sacramento River Islands

The Great Western Power Company of California has undertaken two large construction projects in the island territory of the Sacramento River, according to a statement from Marvin Curtis, Jr., manager of the Rio Vista district of the company.

Work has just been completed on a 22,000-volt line on Sherman Island, 13 miles in length, which will serve 2,200 hp. to the Longview Dredging Company near Rio Vista. The dredger will be engaged for the next eighteen months in moving thousands of yards of material in connection with the flood-control program on the Sacramento River. The extension of the company's lines was made at a cost of \$50,000, and it also will serve the purpose of tying in the Isleton and Antioch substations, strengthening the service in that vicinity.

The Great Western Company also plans to start immediately the construction of its new Isleton substation, which will be located on Grand Island near the town of Ryde. This substation will be one of the most modern of its kind, completely automatic in operation, and will have an installed capacity of 9,000 kw. in transformer equipment. Electric service in the island territory will be augmented by the interconnection of the Isleton substation with the two large substations at Brighton, near Sacramento, and Antioch. The cost of this plant is placed at \$206,000, and it is expected to be in operation by August of this year.

San Francisco Graybar Employees Win Majority of Prizes

Three out of five of the monthly contests run in Western Electric News have been won by employees of the San Francisco Graybar organization. For the best answer to a question selected by the editorial board the Graybar Electric Company and the Western Electric Company offer a \$25 prize. The contest is open to all of the 50,000 employees of the two organizations.

With an employee force of but 400 in the San Francisco branch house, which includes the Oakland store and Emeryville shop, three of these prizes have been won by members of the San Francisco division. C. L. Huyck was the winner of the first contest, giving the best answer to the question, "What is success?" (See Journal of Electricity, Nov. 1, 1925, p. 318.) Mrs. Betty Webster won the next, with an answer to "What does the telephone mean to human progress?" Edith G. Shapirer was winner of the contest on "What is wrong with the younger generation, if anything?"

Utah Employee Awarded Insull Resuscitation Medal

Charles Catron, an employee of the Utah Power & Light Company, at Idaho Falls, Idaho, recently was awarded the Insull medal which is offered to public-utility employees who save human life through the use of the Schaefer prone-pressure method of resuscitation. Presentation of the medal was made by George R. Horning, vice-president and general manager of the Utah Gas & Coke Com-

pany, as Mr. Insull's representative. The ceremony was the outstanding feature of the first morning session of a two-days' conference of division superintendents and line foremen of the Utah Power & Light Company, which took place at the general offices of the company in Salt Lake City.

Mr. Catron's heroic act was performed on March 4, 1925, when George Denning, a farmer living near Iona, Idaho, assisted by his brother, attempted to hoist a "T" derrick under an 11,000-volt distribution line. Two iron guy wires attached to the top of the boom came in contact with the 11,000-volt line, transmitting the current through Mr. Denning's body and knocking him to the ground. With unusual presence of mind his brother removed a rubber from his shoe and with this jerked the iron wires from Mr. Denning's hand. He then was



CHARLES CATRON

picked up, apparently lifeless, and carried to his mother's residence some 200 ft. away.

Mr. Catron, local troubleman for the power company, happened to be in Iona reading meters at the time of the accident. Learning of the trouble he immediately drove over, saw evidences of an accident, and rushed to the victim's house. He found Mr. Denning in a chair, wrapped in blankets, unconscious and not breathing. Mr. Catron placed the victim on the floor and began the prone-pressure method of resuscitation. In fifteen minutes Mr. Denning resumed his breathing.

Mr. Catron has been in the employ of the Utah Power & Light Company for about three years. Previous to that time he was a regular employee of the Shelley Light & Power Company at Shelley, Idaho. Application for the medal in recognition of his successful effort in saving a life was made by Markham Cheever, general superintendent and chief engineer of the Utah Power & Light Company.

Utility of Lander, Wyo., Adopts Merchandising Policy.—The Lander (Wyo.) Electric Light & Power Company is the latest central station in the Rocky Mountain region to announce its conversion to a policy of merchandising. New shelving and counter displays now are being arranged as part of the building renovation plan. It is understood that a model electric shop is planned by this Wyoming central station.

Patent Infringement Suit Won by S. Morgan Smith Company

The suit brought in the district court of the United States for the northern district of Georgia by the Allis-Chalmers Manufacturing Company against the Columbus Electric & Power Company for the use of plate steel scroll cases which were alleged to infringe the W. M. White U. S. patent No. 1076617, issued Oct. 21, 1913, has been decided in favor of the defendant. The defense was assumed by the S. Morgan Smith Company, manufacturers of the plate steel scroll cases, thus holding the users harmless. The defenses were principally invalidity of the patent for want of invention and novelty, and non-infringement. The patent covers scroll cases for water wheels, pumps and blowers made of sheet metal sections, the surfaces of which can be generated by straight line generatrices or the lineal elements of which in the direction of flow are straight.

In the opinion handed down by the court grave doubt is expressed whether any patentable novelty really exists but such doubt is given in favor of the patent and it is allowed to stand. The decree holds that the scroll cases as built and formed by the S. Morgan Smith Company obtain the advantages of the smooth flow of the true spiral casing and do not infringe the patent.

To Relight Main Business Street in San Diego

Contract soon will be let for the relighting of Broadway, San Diego's main business street, from Third to Eighth Streets, it was announced by the city council there recently.

The standards are to be of cast iron and pressed steel and have a mounting height of 20 ft. to light center. They are of the two-light design and are to be reinforced with a 5-in. OD casing which extends from the bottom of the foundation to the arms of the standard. There will be two 10,000-lumen lamps mounted on each standard, and the standards are staggered so that there will be a standard every 46 ft. of street. This means a lighting intensity of 435 lumens per linear foot of street. Refractors are mounted in each lighting unit, which will make for an efficiently well-lighted street.

Considerable semi-business district lighting is going on in San Diego at this time. University Avenue from Third to Park Boulevard, a distance of one mile, and two blocks on Fourth and Fifth Streets will be lighted within the next few days. In this district there will be 110 single-light standards with a mounting height of 16 ft. to light center and equipped with 4,000-lumen lamps. The standards are to be staggered at 60 ft. intervals. Approximately six miles of this type of lighting is contemplated for other semi-business districts and contracts for installation will be let within the next ninety days.

To Build Electric Planing Mill.—A new electric planing mill to cost between \$75,000 and \$100,000 will be added to the lumber plant of the Schafer Brothers mill at Montesano, Wash. The plant will employ 80 men.

News Briefs

Hydro Plant for Colorado Prison.—A small hydro power plant has been put in operation by the Colorado state penitentiary, west of the prison at Canon City, Colo., on the Arkansas River, to accommodate the requirements of its newly installed automobile-license-plate manufacturing plant which was authorized at the last session of the legislature in that state.

Geysers Steam for Power Plant in Japan.—An experimental plant to utilize steam from a geyser has been completed recently at the hot springs of Beppu, Japan, according to Denkinotomo, Japanese electrical magazine. A low-pressure turbine of 3-hp. capacity was installed coupled to a 1.5-kw. electric generator. The plant was installed by the Tokyo Electric Light Company, and experiments as to the operating characteristics of the plant will be carried on for research purposes.

Japanese Fertilizer Company Plans Power Project.—The Nippon Nitrogen Fertilizer Company is contemplating the development of a large hydroelectric power project at Chosen, Japan, on the Choshiko River, according to Denkinotomo. At a head of 2,000 to 3,000 ft. the company plans to develop an initial capacity of 80,000 kw., which will be increased in the future to 120,000 kw. through the erection of a dam. The total cost of the project is estimated at \$12,000,000 (24,000,000 yen). Part of the power developed will be used in connection with local irrigation.

Alouette Development.—Scheduled progress is prevailing on the Alouette development of the B. C. Electric Railway Company, Ltd. The storage dam raising the level of Alouette Lake, the tunnel to carry the waters of that lake through the mountain to Stave Lake, and the transmission line from the Stave Falls plant to the site of the Alouette plant all are completed now. Work on the Alouette power house will be commenced shortly, a cofferdam to be constructed immediately and excavation work to be started in the fall. The plant is expected to be ready for operation in the fall of 1927.

Los Angeles Bureau of Power and Light Enlarges Substation.—Work on an addition to a distribution substation of the Bureau of Power and Light of Los Angeles, located at Avenue 61 and Monte Vista Street, has been started. The present substation has a capacity of 3,000 kw. This new work will add 12,000 kw., bringing the total capacity to 15,000 kw. The outside dimensions of the addition will be 40 by 80 ft. and the structure will be one story high. The building is to be steel frame with a stucco finish, and it is expected to be ready for operation in June of this year. Present estimates place the cost of the addition to the station at \$75,000.

Puget Sound Company Secures 50-Year Franchise for Lines on Wenzell Road, Washington.—The commissioners of Grays Harbor County, Aberdeen, Wash., have granted to the Puget Sound Power & Light Company a fifty-year franchise for running light and power lines on the Wenzell road near Elma. The power company also has applied to the town council of Pell, Wash., for a franchise to furnish light and power to the town.

Bureau of Power and Light, Los Angeles, Establishes New District Headquarters for Work Crews.—Work crews employed in the western and northwestern sections of Los Angeles by the Bureau of Power and Light have moved into new district headquarters at the corner of Hoover and Clinton Streets. The new quarters include a headquarters building, a two-story storehouse, and a large enclosed storage yard, which were completed at a cost of \$175,000. Power-bureau estimates figure the annual economies to be effected in time saved by this centrally located headquarters at \$15,000.

Coast Counties Gas & Electric Company Elects Officers.—At the annual meeting of the stockholders of the Coast Counties Gas & Electric Company, Santa Cruz, Calif., held in San Francisco recently, the following directors were re-elected: R. L. Cardiff, S. Waldo Coleman, J. D. Grant, W. O. Jeter, C. K. McIntosh, C. C. Moore and Ferdinand Reis. Officers were re-elected as follows: president, S. Waldo Coleman; first vice-president, J. D. Grant; second vice-president, W. O. Jeter; secretary and treasurer, W. W. Kamm; assistant secretary and assistant treasurer, P. C. Mahneke.

Mount Spokane Power Company Buys Small Utility.—Purchase of the holdings of John Kulzer, operating a small electric service company at Valley and Kulzer, Wash., north of Spokane, by the Mount Spokane Power Company for an approximate consideration of \$75,000 recently was announced by Mark F. Mendenhall, Sr., president of the Mount Spokane company. A small hydroelectric plant was taken over and a transmission line now is being built to connect the Kulzer system with the general organization of the Mendenhall property.

To Survey Five-Mile Rapids Power Project at Burbank, Wash.—Department of conservation and development at Olympia, Wash., has commissioned Fred Appleby, civil engineer of Tacoma, to make a survey of the Five-Mile Rapids power project, at Burbank, Wash., where the Burbank Irrigation District owns and operates a power canal and plant developing 1,000 hp. electric energy, used for pumping water from the Snake River upon 5,000 acres of district lands. Directors and bondholders of the district believe that the power development may be increased to a minimum of 2,000 hp., and a possible maximum of 20,000 hp. The state department of conservation is interested directly as the owner of \$44,000 bonds of the Burbank Irrigation District and \$142,000 bonds of the Franklin County Irrigation District, which would be served by the increased power.

Application for Diversion of Water from Smith River, California.—C. Romander, whose address is given as in care of James Davis, district attorney, Crescent City, Calif., has filed application to divert 300 sec. ft. of water from the South Fork of the Smith River, tributary to the Smith River, for a power project estimated at \$300,000.

Pacific Gas and Electric Company Buys Middle Yuba Company.—The Pacific Gas and Electric Company, San Francisco, has purchased the Middle Yuba Hydroelectric Company, which operates a distributing system from Alleghany, Calif., to Pike City, a distance of about 12 miles, with numerous feeders to mining properties, for \$65,000. The deal recently was authorized by the California Railroad Commission. The offices of the Middle Yuba Company were in Grass Valley, Calif.

New Distribution Substation Completed by Los Angeles Utility.—The Los Angeles Gas and Electric Corporation has completed a new distribution substation (16,000/2,200-volt) at Tenth and Santee Streets, Los Angeles. The present installation will care for 5,000 kw. a.c. and 1,000 kw. d.c., but the ultimate capacity of the station will be three times as great. Because of the increasing difficulty of getting through the streets of Los Angeles with additional feeder lines, this station has been so constructed as to permit of operating it at 33,000 volts when the load necessitates it. Total cost of the new station will approximate \$250,000.

Seattle Electric Club to Issue Membership Directory.—The board of directors of the Electric Club of Seattle has undertaken the compilation of a small vest-pocket directory of the membership, giving the addresses, telephone numbers, business connections and a list of the merchandise distributed. This is intended to acquaint each member of the club with the business activities of his fellow members, and the directory will be published first in an issue of the club's paper, R.P.M., and later made into a small pocket directory. Secretary P. L. Hoadley is mailing questionnaire post cards to each member, asking for full information relative to his business connections.

Consider Establishment of Rules for Removing Public Service Poles.—The representatives of the Municipal Light and Power Department, of the city of Pasadena, Southern California Edison Company, and the telephone company recently met with R. V. Orison, city manager, and James H. Howard, city attorney, for the purpose of considering the establishment of rules governing the removal of public service poles on the streets. The city is seeking to determine whether individual property owners can bring about pole removals in front of their premises without paying the cost of such work. Mr. Howard said it is likely as a result of this conference that the regulations to be adopted will be put in the form of an ordinance and introduced at an early session of the Board of City Directors.

Pacific Coast Electrical Association

Plans and Committee Personnel for Annual P. C. E. A. Convention Announced

E. R. Northmore, general convention chairman, and his committee are making brave plans for the annual convention of the Pacific Coast Electrical Association, which is to be held in Los Angeles June 7-11, inclusive. While all details have not been worked out, yet the general outline has so far developed as to give a good idea of what is in store.

The sixteen-day summer excursion rate will be in effect on the railroads for the advantage of those who come by rail. Return tickets under this rate may be purchased from all points to Los Angeles at slightly less than one and one-half fare.

The Los Angeles Biltmore Hotel has been secured as convention headquarters. The general sessions will be held in the music room, while the ball room will be available for all purposes requiring larger capacity. Facilities are available for the smaller groups, such as Section and committee sessions. The opening activity will be the registration of delegates on Monday afternoon, June 7. The evening of the same day will be devoted to informal dancing.

Program

The mornings of June 8, 9, 10 and 11, will be devoted to general sessions. The various section chairmen should prepare a list of such subjects of general character as may be of interest to the organization as a whole, together with the time required for presentation, and submit to R. A. Hopkins, program chairman, 420 South San Pedro Street, Los Angeles, for possible inclusion in the program.

Parallel sessions of the various sections and committees are scheduled for the afternoons of the 8th and 9th. Section chairmen are requested to prepare their program in as much detail as possible, including the hour and time allotted to each subject. This information should be in the hands of Mr. Hopkins as soon as possible.

Entertainment

There will be dancing at the Biltmore every evening. Monday, Wednesday and Thursday evening will be more or less informal, with the formal president's reception and ball on Tuesday evening. There will be dancing and entertainment following the banquet on Friday evening. Facilities for golfing will be available at the fifteen golf courses within a half hour's ride of Los Angeles. Automobiles will be provided for drives.

Especial plans are being made for the entertainment of the ladies. Mrs. Baurhyte and the ladies of the executive committee will entertain at tea at one of the country clubs. The privileges of the Edgewater Club at Ocean Park Beach will be at command, with

ocean bathing, salt water plunge, luncheon and bridge. An afternoon of golf and another of touring the motion picture studios also is in store for the ladies.

On Tuesday the convention will meet with the Los Angeles Electric Club for luncheon in the Biltmore ballroom. S. E. Gates, president, and his co-workers in the Electric Club are preparing for one of the star events of the convention.

H. M. Crawford, chairman of the Commercial Section, is preparing two very interesting numbers for the general sessions. The cooking and heating committee and the lighting committee each will report, with apparatus to illustrate their recommendations.

Complete Committee Personnel

The complete roster of the various convention committees follows:

General convention chairman—E. R. Northmore, care Los Angeles Gas & Electric Corporation, Box 1100 Station C, Los Angeles, Calif.

Reception committee—W. L. Frost, chairman, and Mrs. Frost, Mr. and Mrs. William Baurhyte, Mr. and Mrs. Samuel H. Taylor, Mr. and Mrs. F. A. Leach, Jr., Mr. and Mrs. Frank E. Boyd, Mr. and Mrs. F. H. Woodward, Mr. and Mrs. A. E. Holloway, Mr. and Mrs. F. O. Dolson, Mr. and Mrs. A. M. Frost, Mr. and Mrs. D. E. Harris, Mr. and Mrs. J. C. Rendler, Mr. and Mrs. C. T. Hutchinson, Mr. and Mrs. C. E. Heise, Mr. and Mrs. P. M. Downing, Mr. and Mrs. A. B. Day, Mr. and Mrs. S. Waldo Coleman, Mr. and Mrs. James F. Pollard.

Registration and attendance committee—E. H. Jones, chairman; S. C. Haver, Harry Fogwell, H. H. Ranlett, J. C. Kerr, Al May, H. H. Courtwright, H. L. Caldwell, Harold Thrane, F. H. Woodward, O. B. Lyman.

Hotel committee—C. A. Kelley, chairman; J. L. Gray, Don C. Ray, G. P. Mackenzie, F. E. Dellinger, A. W. Copley, Ross L. Mahon.

Program committee—R. A. Hopkins, chairman; R. R. Cowles, H. M. Crawford, D. L. Scott, Frank W. Smith, H. Dewes, C. D. Wiese, W. G. McWhinney, H. H. Cox.

Entertainment committee—K. E. Van Kuran, general chairman; Golf—G. E. Arbogast, chairman; P. H. Booth, W. L. Frost, C. E. Listenwaller, H. F. Boardman, Garnett Young, H. E. Sanderson, W. S. Berry, J. L. Phillips. President's reception and evening entertainment—L. C. LaMont, chairman; Herbert Dewes, W. H. Talbott, Miles F. Steel, Frank Weiss, Ray Carruthers, W. A. Knost. Ladies' entertainment—P. H. Booth, chairman; Mrs. W. L. Frost, vice-chairman; G. E. Arbogast, Harry L. Harper, R. J. McHugh, W. P. L'Hommiedieu, D. E. Harris, Don C. Ray, Mrs. A. B. Day, Mrs. S. E. Gates, Mrs. H. H. Walker, Mrs. E. H. Jones, Mrs. C. E. Heise, Mrs. R. E. Fisher, Mrs. S. Waldo Coleman.

Transportation committee—Harry L. Harper, chairman; Geo. F. Miller, R. C. Powell. Local transportation committee—P. H. Ducker, C. O. Hutchings, W. J. Schaeffer, J. M. Wainscoat, C. D. Wiese, S. B. Shaw, E. V. Kane, J. H. Cunningham.

Electric Club luncheon committee—S. E. Gates, chairman; Roy Lockhart, F. J. Airey, S. W. Scott, O. L. Moore, J. E. Macdonald. Banquet committee—R. E. Smith, chairman; J. G. Loomer, W. A. Knost, P. P. Pine, George Bigelow.

Finance committee—O. L. Moore, chairman; B. T. Story, J. A. Cannon, H. T. Terry.

Publicity committee—D. L. Scott, chairman; C. L. Burgess, H. K. Griffin, J. Chas. Jordan, F. S. Myrtle, James F. Pollard, M. W. Scanlon, F. Z. Stone, W. A. Cyr, Forrest M. Raymond, S. W. Green, H. E. Jones, Al. C. Joy, C. H. Peirson, E. P. Ramsay, R. E. Smith, George C. Tenney, Ben S. Allen.

Special Trains Are Planned for Western N.E.L.A. Delegates

Accommodations in special cars for Western delegates to the N.E.L.A. convention in Atlantic City, May 17-20 are being arranged for so that delegates may join and proceed to the convention from the West in a body. F. M. Carroll, agent for the Chicago & Northwestern Railway, is making up the arrangements and has outlined the following data concerning the special cars. Delegates wishing to attend the convention via these arrangements are asked to write immediately to Mr. Carroll, at 301 Monadnock Building, San Francisco. He will then have a representative of the railway call upon those planning to go, and make individual arrangements with them for their pullman and other accommodations.

Following is the itinerary:

Seattle. Special car leaving Seattle, Union Pacific Railway, 11:15 p. m., May 11, arrives Portland at 6:15 a. m., May 12, and leaves there 9:35 a. m. This car arrives in Boise, Idaho, 5 a. m., May 13, and meets other specials from Spokane, Los Angeles and San Francisco, at Green River, 8:40 p. m., May 13.

Spokane delegates may leave on a special Union Pacific, which leaves 9:10 a. m., May 12, which arrives at Ogden, 7:05 a. m., and leaves 7:20 a. m., May 13, thence to Salt Lake City, arriving at 8:15 a. m., May 13. This train will join the others at Green River, May 13.

Los Angeles special car leaves, Union Pacific, 10:51 a. m., May 12, arriving at Salt Lake City, 12:23 p. m., May 13, leaving there 1 p. m., arriving Ogden, 1:55 p. m., May 13, and leaving 2:35 p. m., arriving at Green River 8:55 p. m., May 13. It leaves Green River 9:05 p. m., arrives Chicago on Chicago & Northwestern at 8:55 a. m., May 15.

San Francisco special leaves Southern Pacific, 11:00 a. m., May 12; arrives Ogden, 2:05 p. m., May 13, transfers to Union Pacific at Ogden, leaving 2:35 p. m., May 13. Arrives at Chicago via Chicago & Northwestern 8:55 a. m., May 15.

All trains are to consolidate at Chicago, and be routed over the Pennsylvania to Atlantic City, arriving there May 16, the morning prior to the opening of the convention.

Advertising Section Changes Meeting Date.—The meeting of the Advertising Section, which has been scheduled for April 30, has been changed to April 23. It will be held in San Francisco.

A. I. E. E. News

San Francisco Section. "Engineering Education" is to be the subject of the address to be delivered by Prof. H. H. Henline of Stanford University at the next regular meeting, Friday, April 23, 1926. The meeting will be held at the Engineers Club, 57 Post Street, San Francisco, at 7 p. m.

Engineering Societies Employment Service has established a branch office in San Francisco at 57 Post Street, Room 715, for the benefit of Pacific Coast engineers. It is urged that all Pacific Coast engineers patronize this new office as fully as possible in order that its establishment may be justified and its continuity assured. N. D. Cook is the manager of the San Francisco branch office.



News of the Electragists



“Let the Code Decide,” Slogan of Inspectors Program Discussed by California Association of Electrical Inspectors Has Significant Meaning

“Let the Code Decide” was adopted as the slogan of the California Association of Electrical Inspectors at its fifth semi-annual meeting which was held in the San Diego Hotel, San Diego, March 22-24. This slogan sums up the outstanding subjects before the convention, standardization and uniform interpretation.

President R. W. Abright, city electrician at Long Beach, presided. John L. Bacon, mayor of the city of San Diego, welcomed the delegates to the city. In his address Mayor Bacon emphasized the service an owner receives for the money he spends for municipal inspection fees. He urged that an effort be made to bring about a better understanding between the public and the municipal authorities, to sell the public the idea of inspection, and to establish a uniformity of inspection. In his address President Abright spoke of the vital interest of the work of the association to the electrical industry, and the need of co-operation between all branches. He stressed the value of establishing a code of ethics within the industry. Mr. Abright also spoke of the need of uniform interpretation of the Code throughout the West. He urged all inspectors to render courteous, efficient service at all times.

Constitutional Changes

The Articles of Association of the organization were changed to provide for the holding of annual meetings only instead of semi-annual meetings; the annual meeting will be held in March.

A new class of membership to be known as “supporting” was established. Any person, firm or corporation interested in the objects of the Association may become a supporting member with annual dues of \$10 per year.

“The Northwest Association of Electrical Inspectors” was the subject of a talk by the secretary-treasurer of that organization, F. D. Weber, chief electrical engineer of the Oregon Insurance Rating Bureau, Portland, Ore. Mr. Weber presented some statistical data on the association, and also urged that the proceedings of the Northwest Association of Electrical Inspectors and the California Association of Electrical Inspectors be published jointly in order that the members of each organization might have the proceedings of both organizations.

L. W. Going, chief electrical inspector, Portland, Ore., and president of the Northwest Association, extended the greetings of that organization. He stressed the need of establishing uniform methods of inspection and uniform interpretation of the Code. Mr. Going stated that local pride was the greatest stumbling block in the way of bringing about a national standard.

H. A. Patton, electrical inspector of the Washington Surveying and Rating Bureau, Seattle, Wash., and a member of the executive committee of the organization, outlined the history of the Northwest Association. He emphasized the necessity of hav-

ing a large attendance at the conventions of the organizations in order to accomplish the greatest results and to build up prestige. Mr. Patton urged that representatives from each of the Pacific Coast electrical inspectors' associations be present at the conventions of the other. He also suggested that joint committees work on the problems of standardization, the universal need in the West.

C. W. Mitchell, B. C. Hill and R. H. Manahan were appointed as a standardization committee to work with a similar committee from the Northwest Association.

The afternoon session was opened with an address by F. M. Downer, city attorney of San Diego. He discussed the authority and power invested in city electrical inspectors in enforcing ordinances. He particularly discussed the question of validity of city ordinances which include the National Electrical Code and the State Safety Orders as part of the ordinance. In his opinion such a provision would be upheld in the courts.

“The Attitude of Public Utilities toward the Electrical Inspector and His Work” was the subject of a paper presented by E. J. Crawford, assistant general superintendent, San Joaquin Light & Power Corporation, Fresno. In this paper Mr. Crawford showed that inspection is essential; that it is naturally a function of the local government; that the various codes and rules for guidance are not necessarily the last word in construction; and that the inspectors should be broad-gaged men who should interpret the various regulations with the intent of the law in mind.



Delegates in attendance at the convention of the California Association of Electrical Inspectors which was held in San Diego March 22, 23 and 24.

W. F. Brainerd of the California Electrical Bureau, Los Angeles, outlined the Red Seal plan. He presented some history of the Bureau and its position in the electrical industry. In summing up the value of the Red Seal on a home he said it assures the owner that his electrical installation is not only safe from hazard but also that it is adequate.

"Promoters of Public Welfare—The Code—The Inspector" was the subject of a paper by W. J. Canada, electrical field secretary of the National Fire Protection Association, New York City. This was read by C. W. Mitchell at the Tuesday morning session in the absence of Mr. Canada. Mr. Canada outlined the history of the National Electrical Code. He expressed the desirability of having one standard, eliminating local codes and rules. The need of a unified national association of electrical inspectors was treated in the paper.

In the absence of H. H. Walker of Los Angeles, president of the California Electragists, C. J. Geisbush, executive secretary of that organization, spoke on the attitude of the electrical contractor toward the electrical inspector. He expressed the belief that the contractors were willing to co-operate with electrical inspectors. He suggested that meetings on code and ordinance interpretations be held between the city inspection department and the contractors, citing the good which such meetings already have accomplished in Los Angeles (Journal of Electricity, Nov. 1, 1925, p. 342), and also in San Diego. The question of licensing and bonding also was discussed.

"Electrical Accidents in Industrial Plants, Statistical Data, Precautionary and Preventative Methods" were discussed by George E. Kimball, electrical engineer, Industrial Accident Commission of California, San Francisco. Although the Safety Orders of the Commission apply primarily only in places of employment, they have been included as part of the ordinance of many cities to apply in all installations. Mr. Kimball read a number of accident reports received by the commission which pointed out the necessity of using every precaution possible. In nearly every case the accident might have been prevented if proper guarding and

grounding had been provided. The hazards existing in temporary wiring installed in buildings during the course of construction were emphasized, especially wiring for concrete mixers and similar equipment.

"Non-Metallic Sheathed Cable" was discussed by F. E. Downing of the Rome Wire Company, Chicago. He presented the history of its development and the rules for its installation recently adopted by the Electrical Committee of the National Fire Protection Association (Journal of Electricity, March 15, 1926, p. 229).

Due to the amount of work before the convention it was necessary to hold an evening session. This session was devoted primarily to discussion of the more important changes in the rules of the National Electrical Code as contained in the 1925 edition. These were first presented by James M. Evans, electrical engineer, District C, Board of Fire Underwriters of the Pacific, Los Angeles. Single-pole fusing and grounding provisions were the outstanding changes which were discussed.

Changes in Rules of the National Electrical Code adopted by the Electrical Committee of the National Fire Protection Association at its meeting in New York City, Feb. 18, 1926, (Journal of Electricity, March 15, 1926, p. 229), were discussed by C. W. Mitchell, electrical engineer, Board of Fire Underwriters of the Pacific, San Francisco. Mr. Mitchell stated that these rules must be approved by the National Fire Protection Association, which meets in May, and then by the American Engineering Standards Committee, which meets in September, before they become a part of the National Electrical Code.

The report of the National Electrical Code Committee of the California Association was presented by R. W. Abright. The function of this committee is to receive suggestions relative to proposed changes in the Code from inspectors or anyone in the electrical industry; put them in the proper form and submit them to the Code committee of the National Fire Protection Association for approval. Suggestions may be sent to any one of the members of the California Committee: F. A. Morrell, city electrician, Stockton; H. W. Stitt, city

electrician, Fresno; R. W. Abright, city electrician, Long Beach; C. W. Mitchell, electrical engineer, Board of Fire Underwriters of the Pacific, San Francisco; and C. E. Hardy, chief, Department of Electricity, Oakland.

B. C. Hill, Oakland, reported for the universal ordinance committee. The report included a questionnaire which had been sent out by the committee and the results that had been obtained. A large majority of those who replied to the questionnaire considered a universal ordinance desirable. Further work will be done by this committee and an effort made to bring about the adoption of a uniform ordinance.

The subject of allowing an electrical wireman's license to be transferable between cities was discussed.

Questions which had been submitted by members were answered from the floor. Most of these dealt with the Code and the Safety Orders.

The following men were elected to honorary membership in the association: J. Emerson, formerly city electrician, Vallejo, Calif.; L. W. Going, Portland, Ore., president of the Northwest Association of Electrical Inspectors; F. D. Weber, Portland, Ore., secretary-treasurer; H. A. Patton, Seattle, Wash., executive committeeman of the same association; and Thomas E. Lee, Seattle, Wash., International Brotherhood of Electrical Workers.

The officers elected at this meeting were: president—B. C. Hill, supervisory inspector, Oakland; vice-president—R. H. Manahan, city electrician, Los Angeles; secretary-treasurer—C. W. Mitchell, electrical engineer, Board of Fire Underwriters of the Pacific, San Francisco. Executive committee: R. W. Abright (active), city electrician, Long Beach; V. W. Hannum (active), electrical inspector, Anaheim; W. H. Talbott (associate) San Diego Consolidated Gas & Electric Company, San Diego; Arthur Kempston (industrial), Majestic Electric Appliance Company, San Francisco; and Leon Shook (supporting), International Brotherhood of Electrical Workers, San Francisco.

Sixty-seven members were registered at the convention. The entertainment and hospitality of San Diego citizens were outstanding features of the convention.



Some of the men who did a great deal to make the convention of the California Association of Electrical Inspectors a success. Left to right—A. E. Johnstone, city electrician of San Diego; R. W. Abright, city electrician of Long Beach; and William Harrison, electrical inspector of San Bernardino. Mr. Johnstone was particularly active in arranging much of the entertainment which was provided for the delegates. Mr. Abright, president of the Association, has been instrumental in fostering the work of the universal ordinance committee.

The Northwest Association of Electrical Inspectors was well represented at the convention of the California Association. Left to right—L. W. Going, electrical inspector, Portland, Ore., president; A. E. Griswold, A. G. Manufacturing Company, Seattle, Wash.; H. A. Patton, Washington Surveying and Rating Bureau, Seattle, Wash., executive committee; Thomas E. Lee, International Brotherhood of Electrical Workers, Seattle, Wash.; and F. D. Weber, electrical engineer, Oregon Insurance Rating Bureau, secretary-treasurer.

Meetings

Meeting of Colorado Electrical Men Is Highly Successful

All expectations were surpassed in interest, attendance and results developing from the first state-wide meeting of electrical men held in Denver March 26 under the auspices of the Electrical League of Colorado. This is the report from league officials who advise that because of the success attendant upon the first meeting and the popular interest that already has been developed, it is likely that such an affair will be made an annual event. The attendance at the meeting was 224, a new record for any electric or utility meeting in the Mountain region. More interesting and even more gratifying to league officials was the response of contractors. This division led in attendance with a total of 62 and of this number 29 came from points outside of Denver.

The meeting started early in the morning and continued through the day with a banquet at night. Every phase of electrical and utility association activity in the Mountain region was explained and discussed. This part of the program included papers by C. A. Semrad, president, Rocky Mountain division, N.E.L.A., George E. Lewis of the Rocky Mountain Utility Information committee, and E. F. Stone, president of the Colorado Public Service association. Samuel Adams Chase, special representative of the merchandise division, Westinghouse Electric & Manufacturing Company, was the principal speaker on the afternoon program. His subject was "Selling the Electrical Idea to the Public."

Higher wiring standards, improved inspection and the necessity therefor and other phases of wiring practice were discussed by representatives of the underwriters and inspection departments. The Red Seal Plan was introduced officially at the meeting in the address of S. W. Bishop, executive manager of the Colorado league, with a distribution of the minimum wiring standards required for operation of the plan in Denver and vicinity.

One of the surprise features on the program following the banquet was the presentation of little gold replicas of the league insignia to the past chairmen of the organization. Recipients were E. C. Headrick, John J. Cooper, O. L. Mackell, H. D. Randall, W. A. J.

Guscott and A. C. Cornell, the present chairman.

Mr. Cornell presided at the opening of the day sessions and was relieved by the vice-chairmen of the league, W. A. J. Guscott and F. F. McCammon. Mr. Cornell served as master of ceremonies at the banquet. L. M. Cargo was chairman of the general committees arranging the one-day convention.

Red Seal Progress Reported to Bureau Advisory Meeting

The Red Seal Plan's progress in California came in for considerable commendation and discussion at the last meeting of the advisory committee of the California Electrical Bureau, held in Los Angeles, March 12. Reports of buildings already being built under the plan, difficulties still to be surmounted and ideas for its extension were discussed. One not-

were charged with the responsibility of bringing to the next meeting any suggestions for slogans which they might receive or create.

Plans to carry out another June Bride campaign on appliance sales were outlined, and rather than just a "week" the effort is to be urged for the entire month of June, it was decided.

The advisability of establishing a speakers' bureau in the work of the bureau was discussed. This idea was thought worth following up, first from the point of view of the Red Seal Plan, and later to develop into a speakers' bureau on all subjects pertaining to the electrical industry.

Book Reviews

SIGNAL WIRING.

By Terrell Croft, Consulting Engineer, author of numerous technical books and member of various engineering societies. First edition 1926. 5 1/2 x 8 in. Cloth bound. 349 pages, 464 illustrations. \$3. McGraw-Hill Book Company, Inc., New York.

No introduction of the author or of his works as a whole is needed. His gift of presenting practical information in a manner thoroughly understandable and usable by the practical man is followed out in this book. As the author states, signal wiring from the point of view of the man who installs it primarily is a matter of knowledge of circuits. Therefore the author limits himself to an extensive presentation of wiring diagrams and pictorial representations.

Practically every conceivable type of diagram, from the simplest bell circuit to the complicated circuits involved in turbine-room signal systems, is represented in the book. Further than fully explanatory captions for each illustration there is no text in the first fifteen divisions of the book. Signal wiring methods is the subject treated in division 16, and in this division some text is used, heavily reinforced with illustrations.

Transmission Line Handbook, published by the Rome Wire Company, Rome, N. Y. This 62-page, flexibly bound booklet is a compilation of miscellaneous tables, charts, constants and other information useful to men dealing with electric transmission and distribution. Data pertaining to various classes of conductors are given.

COMING EVENTS

- Advertising Section, P.C.E.A.—
San Francisco, Calif.,
April 23, 1926
- National Electric Light Association—
Annual Convention—Atlantic City, N. J.
May 17-21, 1926.
- Electrical Supply Jobbers' Association—
Annual Convention—Hot Springs, Va.
May 31-June 4, 1926
- Pacific Coast Electrical Association—
Annual Convention—Biltmore Hotel, Los Angeles
June 8-11, 1926
- Associated Manufacturers of Electrical Supplies—
Annual Convention—Hot Springs, Va.
June 7-12, 1926
- Northwest Electric Light and Power Association—
Annual Convention—Spokane, Wash.
June 14-17, 1926
- Northwest Electric Light and Power Association—
Annual convention—Spokane, Wash.
June 16-19, 1926.

able incident was the interest taken by representatives of the telephone company in the plan and the expressed wish of those representatives that wiring for a telephone outlet be considered also in the specifications. To this end a representative of the telephone company will be asked to sit on the advisory committee of the bureau.

Need for some pamphlet to send prospective home-owners, and likewise for methods of reaching the building contractors as well as the architects, was expressed. A slogan for the Red Seal campaign was required, it was felt, and members of the committee



A record for attendance was set at the state-wide meeting of Colorado electrical men held in Denver March 26.

Personals

Dr. Michael I. Pupin, president of the American Institute of Electrical Engineers, was the guest of honor of the University of California and the principal speaker at its Charter Day exercises held March 23 in Berkeley. During the ceremonies the honorary



DR. MICHAEL I. PUPIN

degree of Doctor of Laws was conferred upon Dr. Pupin. Three days later he was the guest of honor and speaker at the meeting of the San Francisco Section of the A.I.E.E. In 1874 Michael Pupin, a native of Idvor, Banat, now part of the Kingdom of the Serbs, Croats and Slovenes, landed in New York, a boy of sixteen, without funds and without a knowledge of English; today he is one of the foremost electrical engineers and physicists of his time. In the intervening years he graduated with high honors from Columbia University, returned to Europe for graduate work in physics and mathematics at the University of Cambridge, England, and at the University of Berlin, Germany, and returned to Columbia University. There in 1889 with the late Prof. F. B. Crocker as instructor in mathematical physics he started the electrical engineering department. His earliest work dealt with the study of the passage of electricity through rarefied gases. In 1892 he took up the subject of electrical resonance which resulted in the invention of the employment of tuned circuits for selective electrical reception of signals. In 1895-6 Dr. Pupin developed a method of rectifying both low and high-frequency oscillations so as to make them detectable by d.c. instruments. In February, 1896, he invented a method of rapid X-Ray photography by laying a fluorescent screen upon the photographic plate, a method now universally employed. In March of the same year he discovered secondary X-Ray radiation. His most famous accomplishment is the invention of the Pupin loading coil, which has greatly improved long-distance telephone transmission by the introduction of suitable inductance coils along the wires at

predetermined distances. This invention was acquired by the American Telephone & Telegraph Company in 1901. During the war Dr. Pupin, who served on several important national committees, developed a method of submarine detection by means of very high-frequency sound waves sent out by a panel of vibrating quartz plates. In prosecuting this work he developed a multi-step vacuum tube amplifier which is free from internal noises and does not transmit low frequency under-water noises. In addition to the Edison Medal, which he was awarded in 1920, Dr. Pupin has won awards from the Franklin Institute, the Social Science Association, the Radio Institute of America and the French Academy, and holds honorary degrees from many prominent American universities. Dr. Pupin is now professor of Electro-Mechanics of Columbia University and director of the Phoenix Research Laboratory of the same university.

Dwight G. Phelps, for many years sales manager of the Colt's Patent Fire Arms Manufacturing Company, has been elected vice-president of the Johns-Pratt Company, Hartford, Conn., in charge of sales. The Johns-Pratt Company is an important division of the Colt's company.

W. P. Johnston has been appointed operating head of the Spokane & Eastern Railway & Power Company and the "Inland" interurban system, Spokane, Wash., with the tentative title of assistant general manager. He will succeed Waldo G. Paine, general manager, who died suddenly at his home in Spokane on Feb. 20.

Dr. Oskar von Miller, eminent hydroelectric and hydraulic engineer of Munich, has been awarded the Grashof medal by the German Society of Engineers on the occasion of his seventieth birthday. Dr. von Miller recently paid a visit to America in connection with the proposed establishment of a national museum devoted to engineering and allied subjects.

George L. Hatheway, president of the Clifton Manufacturing Company, Boston, was a guest of the Electric Sales Company, Los Angeles, a short time ago.

Dr. R. J. Wiseman, research engineer of the Okonite Callender Cable Company, Patterson, N. J., recently visited the Pacific Coast. During his tour of investigation he was accompanied by J. L. Phillips, San Francisco district manager of The Okonite Company and The Okonite Callender Cable Company.

Frank U. Bliss, Portland district manager of the Pacific Division of the National Lamp Works, was a recent visitor in Salt Lake City.

William H. Lines, assistant to the president, Portland Electric Power Company, Portland, has been put in charge of the railway and bus operations of the company, succeeding Franklin I. Fuller, deceased, and also has been elected to the position of director. He retains his title of assistant to the president.

Henry Dralle, of the general engineering department, Westinghouse Electric & Manufacturing Company, East Pittsburgh, a short time ago completed an extensive tour of the Pacific Northwest in the interests of oil well electrification.

Ray Turnbull, Pacific Coast sales manager for the Edison Electric Appliance Company, was a recent visitor in Spokane.

Richard Hall, manager, Illinois Electric Company, Los Angeles, recently departed on a business trip East via the Panama Canal.

D. O. Rusk, formerly one of the assistant engineers of the Curtis Lighting, Inc., of Chicago, has been appointed assistant engineer to F. S. Mills, vice-president, Curtis Lighting of California, Inc. Mr. Rusk is a graduate of the University of California.

Dr. Robert Andrews Millikan, director of the Norman Bridge Laboratory of Physics and executive head of California Institute of Technology of Pasadena, Calif., who won the Nobel Prize in physics in 1923, is delivering a series of twelve lectures at Cornell University, Ithaca, N. Y. Dr. Millikan will devote the series to "The Evolution of the Elements" or "Matter and Radiation."

Walter Ayden, formerly manager of the Oakland branch of the Fobes Supply Company, has resigned to become manager of the newly opened Oakland branch of The Electric Corporation, Los Angeles.

Felix Van Cleef, of Van Cleef Bros., Chicago, recently made an extensive tour of the Pacific Coast.

W. C. Sears, formerly of Landers, Frary & Clark, New Britain, Conn., has resigned to take the position of sales manager of the Rochester Stamping & Enameling Company, Rochester, N. Y.

S. E. Gates, manager of the Los Angeles branch of the General Electric Company, has been elected president of the Los Angeles Electric Club, succeeding J. E. Macdonald. Mr. Gates has been in Los Angeles since May, 1924, going there from Spokane where for fourteen years he was in charge of the office of the General Electric



S. E. GATES

Company in that city. In Spokane, in addition to his activity in the electrical field, Mr. Gates took a prominent part in civic affairs, particularly in connection with the Chamber of Commerce, of whose industrial bureau he served as chairman during 1923. Since his arrival in Los Angeles Mr. Gates has taken an active interest in the Electric Club, and the members are looking forward to a year of progress under his administration.

Wayne Cargo, son of L. M. Cargo, district manager, Westinghouse Electric & Manufacturing Company, Denver, has returned from East Pittsburgh where he has been associated with the Westinghouse company since his graduation from the University of Colorado in 1914, to become manager of the machinery department of the Mine & Smelter Supply Company.

W. O. Roach, of the Roach-Appleton Manufacturing Company, Chicago, paid a visit to Los Angeles a short while ago.

E. D. Kilburn, vice-president and general sales manager, the Westinghouse Electric & Manufacturing Company, East Pittsburgh, spent a day in Spokane recently.

E. A. Phinney, president, Jefferson County Power & Light Company, Golden, Colo., accompanied by Mrs. Phinney, were recent visitors in Los Angeles.

J. A. Hale has been promoted from the position of assistant chief engineer of the Utah Power & Light Company, Salt Lake City, to that of chief engineer to succeed Markham Cheever, who has joined the staff of the Electric Bond & Share Company in New York. Mr. Hale joined the Utah Power & Light Company organization in February, 1913, and during the entire period since that date he has been connected with the engineering department of that company. He was born in Roanoke, Va., in 1888, and during his early life was employed for a number of years in the construction department of the Norfolk & Western Railroad in Virginia and West Virginia. Immediately after his graduation from the Virginia Polytechnic Institute in 1911, he went to Utah and entered the employ of the United States Reclamation Service, where he was engaged in engineering work in connection with the construction of the

Mel Hirsch, formerly with the California Electrical Supply Company, and William Schafer, formerly with Fobes Supply Company, both of San Francisco, have joined the sales force of the Wholesale Electric Company in that city. V. L. Maxam has been appointed credit manager and sales promoter for the same concern.

M. H. Beekman, who has been manager of the service department of the Edison Electric Appliance Company, Inc., Chicago, has been appointed manager of the appliance division to succeed A. H. Jaeger, resigned. D. C. Marble has been transferred from his position as assistant to the sales manager of the range division to take the position left vacant by Mr. Beekman.

Fred M. Pierce, radio troubleman, represented the San Diego Consolidated Gas & Electric Company at the radio interference conference of Los Angeles radio dealers held in March.

E. C. Hutchinson, vice-president and general manager, Pelton Water Wheel Company, San Francisco, recently left for Philadelphia to attend a conference with officials of the Wm. Cramp & Sons Ship and Engine Building Company, of which the Pelton company is a subsidiary.

R. T. Pierce, manager of sales of relays and switchboard meters, Westinghouse Electric & Manufacturing Company, recently completed a tour of the entire Pacific Coast. Mr. Pierce's headquarters are at the Newark, N. J., works of the Westinghouse company.

P. E. Chapman, who was formerly superintendent of underground distribution for the Pacific Gas and Electric Company in its San Francisco district, has been made assistant electrical engineer for the company in the same division. R. P. Lutz, who has been assistant superintendent, succeeds Mr. Chapman as superintendent of underground distribution, and H. K. Woodward has been appointed to Mr. Lutz's former position as assistant superintendent. All of these men have records of many years of service with the Pacific Gas and Electric Company.

O. K. Jones, formerly with the Great Western Power Company, San Francisco, has resigned to become an electrical inspector for the city of San Francisco.

Ross Hartley, of The Electric Corporation, Los Angeles, recently visited the company's northern branches, which are located at Portland and Seattle.

W. D. McElhinney has been appointed vice-president in charge of sales, Copeland Products, Detroit. He was formerly sales manager of the commercial department of the Frigidaire Division of the Delco Light Company. Mr. McElhinney is contemplating a visit to the Pacific Coast shortly.

Charles E. Hammond, secretary and treasurer of the Signal Electric Manufacturing Company, Menominee, Mich., recently resigned from that connection. He has been succeeded by W. J. Tideman of the Signal organization.

Carl Peirce, president, Hubbard & Company, of Pittsburgh and Chicago, was a recent visitor in San Francisco for the purpose of conferring with his company's local representatives, the Pacific States Electric Company.

L. W. Brainard, since 1919 with the Idaho Power Company, Boise, in different capacities, recently has been made superintendent of appliance sales, a newly created position. He was born in Dennison, Iowa, in 1892, but moved to Payette, Idaho, where he received his preparatory schooling. His college career at Whitman College, Walla Walla, Wash., was cut short by two years' service in the army during the World War. After being discharged in 1919, Mr. Brainard entered the service of the Idaho Power Company as storekeeper at



L. W. BRAINARD

Pocatello, Idaho. In 1920 he joined the sales force of the company's commercial department, being assigned to the Pocatello division, and in 1922 was made division salesman in charge of all the sales in that division. He remained in this capacity until May, 1925, when he was transferred to Boise and promoted to take charge of the appliance sales department under J. F. Orr, sales manager.

R. G. Chamberlain, district manager of the Electric Household Utilities Corporation, spent a few days in Spokane lately.

F. C. Holtz, chief engineer, Sangamo Electric Company, Springfield, Ill., visited San Francisco lately. While there he conferred with L. A. Nott, manager of the Sangamo company in that city.

Frank B. McKnight has resigned his position as joint pole easement agent with the San Diego Consolidated Gas & Electric Company to go into business. He will open offices at 834 F Street, San Diego, where he will conduct a blueprinting and photostating business and also deal in general engineering supplies.



J. A. HALE

Strawberry tunnel as a part of the government's Strawberry reservoir project in the Uintah basin. He followed that line of activity for a period of two years prior to his becoming associated with the Utah Power & Light Company. Mr. Hale is identified prominently with the Utah chapter of the American Institute of Electrical Engineers, and is an ardent worker in the interests of that organization.

Obituary

Walter B. Jones, Seattle, until recently district representative of the Economy Fuse Company in Seattle, died of a heart attack on March 7. Mr. Jones had been identified with the electrical industry in Seattle for ten years, the last four with the Economy company.

TRADE NOTES

The Edison Electric Appliance Company, Inc., Chicago, is putting on the market its new Hotpoint Calrod electric iron. This iron, which in appearance is the same as the Hotpoint Thumb Rest, contains the Calrod heating element which the company claims multiplies many times its efficiency, speed of operation and durability. In the Calrod process, after the nickel chromium tube has been filled with magnesium oxide powder in and around the helical coil it is compressed in diameter so that the magnesium oxide is as hard as granite. This construction makes it possible to bring the current in with a heavy terminal conductor and make the joints away from the air. A further advantage claimed for Hotpoint Calrod is that molten iron can be poured around it in a mold, encasing the heating element inside solid metal, where it is sealed in forever and protected against physical abuse or damage.

The Driver-Harris Company, Harrison, N. J., has appointed J. C. Bilek as Chicago district manager for the company. H. D. Tietz will be associated with Mr. Bilek as assistant district manager.

American Wiremold Company, Hartford, Conn., has increased its capital stock from \$200,000 to \$600,000. The company makes wire conduits and flexible wire, and it is now to develop new wire specialties paralleling its present lines. The new directors chosen were W. K. Murphy of Los Angeles, H. B. Kirkland of New York City and D. Hayes Murphy. The latter was chosen as president and treasurer with H. B. Kirkland as vice-president and W. D. Ball secretary.

Graham Brothers, Detroit, has issued a 68-page booklet, "Trucks for Public Utilities," containing facts for the guidance of public-utility operators in the selection of motor trucks. The book is illustrated fully and contains reproductions of the various types of trucks manufactured by the company. A full-page reproduction of the Royal Gorge in colors is shown on the frontispiece and other scenic effects of power developments are given in the book.

The Western Sales & Engineering Company has been organized in Denver as representatives and distributors of the Electric Refrigerator Corporation. The complete line of that company will be handled, including Kelvinator equipment, Grand Rapids and Leonard refrigerators, and Nizer Corporation units. The new company is located at 1163 California Street.

Bakelite Corporation, New York, has issued a folder entitled, "Bakelite Supersedes All These Materials," the materials named being amber, celluloid, fibre, gallalith, glass, horn, ivory, jet, metal, paper, porcelain, rawhide, rubber, shellac, vegetable ivory and wood. Illustrations show various articles made of Bakelite that formerly were made almost exclusively of the materials named.

Delco Light Company, Denver, has established new headquarters for Frigidaire refrigerating equipments with the opening of an uptown sales office and demonstration room at 1134 Broadway, in the heart of the automobile district. This action follows the closing of the refrigerator school recently conducted by the company in Denver for its dealers and salesmen in the Mountain region and the launching of a comprehensive newspaper advertising campaign.



An engineering conference as to the stresses and inducances due to niblick or mashie on the course of a golf ball is holding these two experts teed. George E. Quinan, chief electrical engineer, Puget Sound Power & Light Company, Seattle, says niblick. L. N. Robinson, electrical engineer, Stone & Webster, Inc., Seattle, however, thinks it should be something else again.

Curtis Lighting, Inc., Chicago, has added the Canadian Provinces, Alberta, Vancouver and British Columbia, to the territory covered by its resident engineer, Charles T. Boyd. His territory formerly consisted of Washington, Oregon, Idaho and Montana. He makes his headquarters in the Douglas Building, Fourth Avenue and Union Street, Seattle.

Allen & Billmyre Company, Inc., New York, is manufacturing a new design of semi-heavy-duty portable vacuum cleaner with dust-blower attachment, which is especially adaptable to hotels, office buildings and hospitals. The machine is equipped with a ½-hp. universal Westinghouse motor and weighs 105 lb. It is compact and ruggedly built and can be classified as standing between the small household vacuum cleaner and the heavy-duty portable and stationery pneumatic sweeping systems for industrial work.

The Westinghouse Electric & Manufacturing Company, East Pittsburgh, now is building the Westinghouse automatic iron with a heel rest in place of the separate stand formerly used. With this rest the iron can be turned up on its heel and placed anywhere without danger of burning the material on which it rests.

Jefferson Electric Manufacturing Company, Chicago, has produced a new bell-ringing and signal transformer, which is attached to an outlet box cover and will be known as the "Nucode." It is designed for the average residence or small apartment.

The American Resistor Corporation, Philadelphia, recently has placed on the market Globar non-metallic heating elements in diameters up to 1½ in. and 2 in. The increase in available diameters offers a means of securing greater kilowatt capacity per unit and hence fewer units are required in any one furnace application.

Kliegl Brothers, New York City, have issued a new 128-page catalog entitled "Kliegl Theatrical Decorative Spectacular Lighting." The book is complete in every detail with illustrations and price lists and minute descriptions of the various types of lighting effects.

The Domestic Electric Company, Cleveland, recently has placed on the market a small but sturdy universal motor, especially adapted to use on industrial jobs for which hand power is not satisfactory yet which requires a light, portable power unit. The motor weighs only 42 lb. and is particularly useful for operating appliances like pipe-threading machines, small grinders, wood shapers and routers, portable drills, etc.

The Ohio Brass Company, Mansfield, Ohio, has issued a small booklet on "Gas-Welded Bonds on the Erie." This is a reprint of an article appearing in the March issue of Railway Signalling by C. A. Nichols, signal supervisor, Erie Railroad, Huntington, Ind.

Electric Service Supplies Company, New York, Philadelphia and Chicago, has issued bulletin No. 220 on Keystone expulsion type lightning arresters. The subject is covered fully and illustrated with photographs and drawings.

The United Electric Company, Canton, Ohio, has made improvements in the complete set of Ohio electric cleaner attachments. Changes are being made in the brushing and suction tools so as to furnish a combination tool which can be used either with or without the brush. This new combination tool will replace separate brush and suction tools.

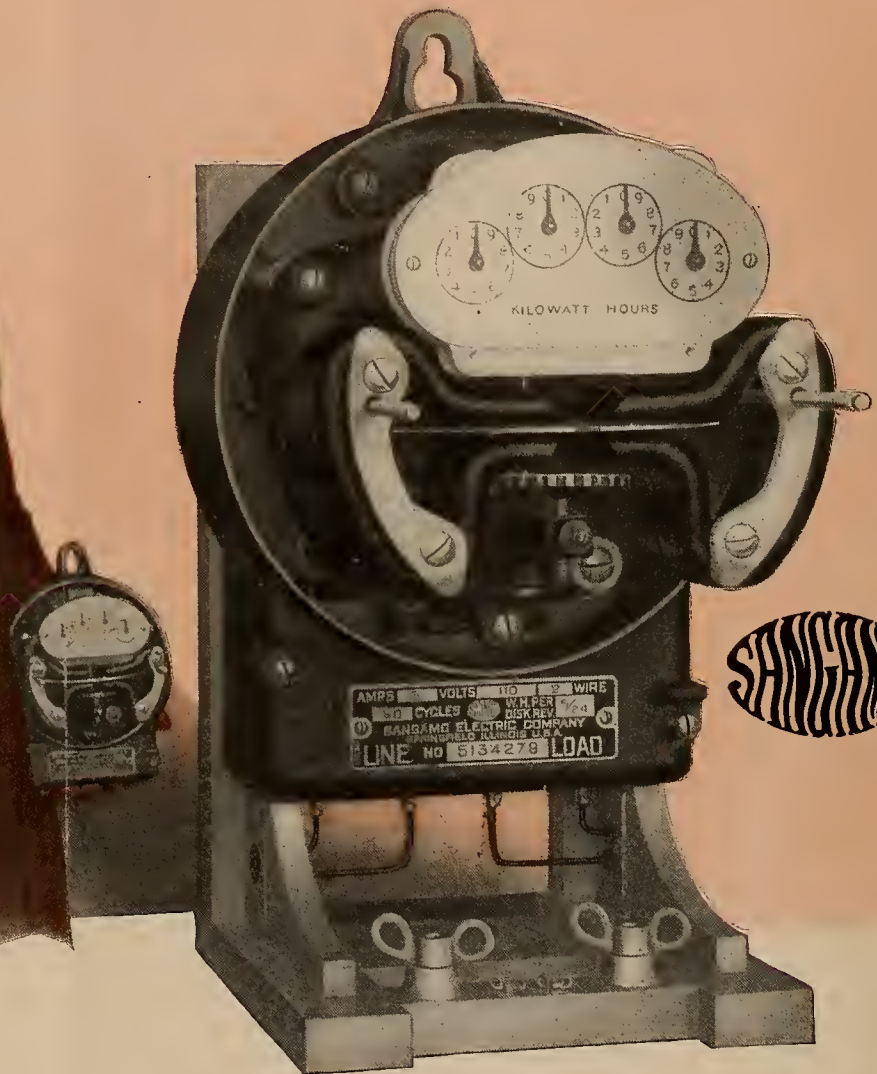
The United States Electric Company, San Francisco, has moved into larger quarters and now is located at 1038 Polk Street.

The Electrical Supply & Construction Company of Denver has been named a distributor of the lighting fixture line produced by the Markel Lighting Fittings Company of Chicago.

General Electric Company, Schenectady, has issued a 33-page illustrated publication, which presents authoritative information on means for power factor improvement in industrial plants.

Journal of Electricity

Devoted to the Economic Production and Commercial Application of Electricity
IN THE ELEVEN WESTERN STATES



Dedicated to the service of the industry

THIS giant Sangamo meter is an exact replica of the standard type H meter, held by Mr. Otis White, general superintendent and mechanical designer of the Sangamo Electric Company—who is responsible for the proven mechanical excellence of nearly four million Sangamo meters, produced since the inception of the company, over forty-eight years ago. The big meter is not a dummy. Except in size, the parts are duplicates of the standard type H parts and the meter measures true kilowatt hours under regular service conditions. The

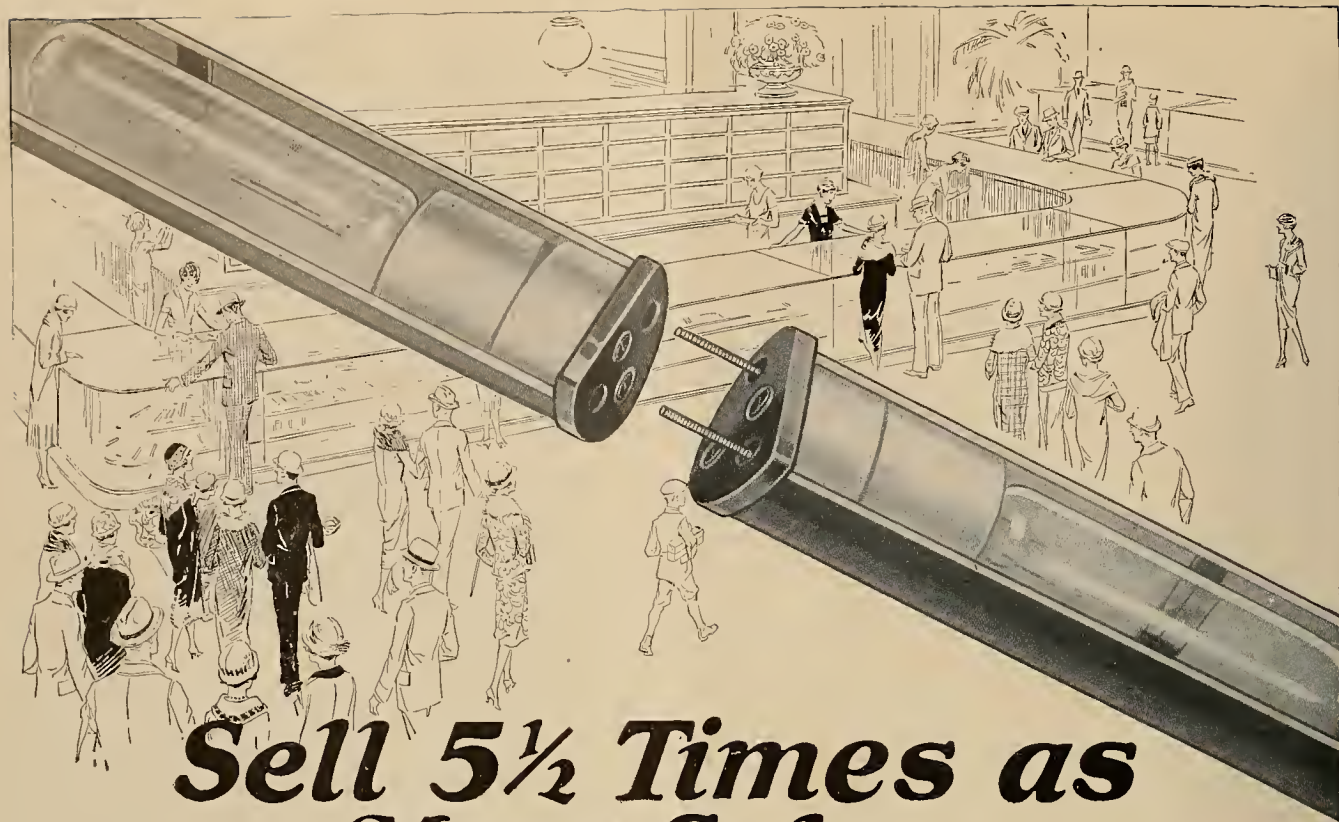
cubic content of the big meter is forty times that of the regular type H, and the torque is twenty times as great. Painsstaking workmanship and exact reproduction of standard design are shown by the fact that the big meter will run accurately on a 5-watt load.

The first giant meter was built for the Central Illinois Public Service Company to be used in public relations work. It is attracting wide public interest. This meter will be on exhibition in the Sangamo booth at National Electric Light Association Convention.

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Devoted to the Economic Production and Commercial Application of Electricity

IN THE ELEVEN WESTERN STATES

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Spreading the Message of the Red Seal Home

THE Red Seal plan in various sections of the West is gathering momentum, slowly but surely, and promises to mark the greatest step forward in co-operative sales promotion that this section ever has known. In California, British Columbia and Colorado progress is being made. For March, the first actual month of operation in California, fifty Red Seal applications were recorded. The quota which has been set for that state for the year is 2,000 Red Seal homes. In other sections quotas have been set accordingly.

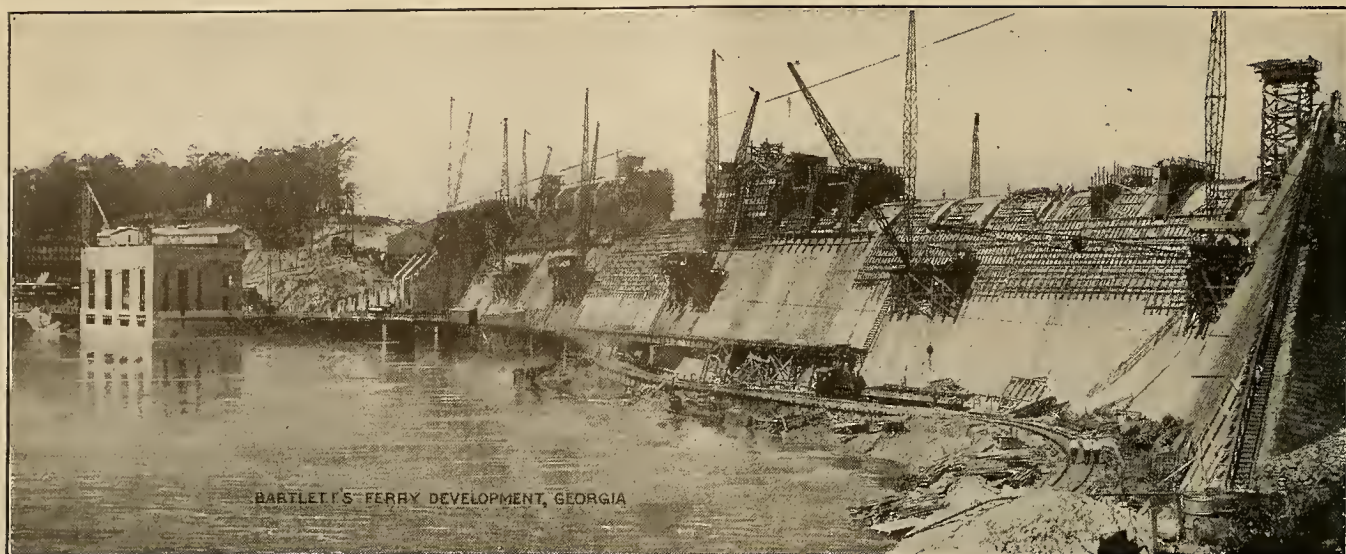
The problem of popularizing the Red Seal idea is largely one of publicity. The initial step in the sales program is telling the Red Seal story to contractors, builders and architects. The next step is to reach the public. Before either of these can be taken the electrical industry itself must be fully sold and must possess a thorough grounding in the elements of the Red Seal idea.

It has been and is the intention of the Journal of Electricity to give the Red Seal program as much publicity as it warrants. In this manner the industry will be kept advised of all developments and will be able to better spread the Red Seal message. Watch the columns of the Journal for information regarding the progress which is being made.

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New Water Power Construction

NEW water power construction by Stone & Webster includes a variety of plants providing power for both public utilities and isolated industrial establishments. The work is widely distributed, the southernmost development being in Georgia on the Chattahoochee River, the northernmost in Michigan on the Menominee River, the most easterly in New Hampshire on the Merrimack River, the most westerly in Washington on the Baker River. Old plants have been reconstructed securing maximum power from existing stream flow, and new plants have been built, some high head and some low head with dams including both concrete and earthfill construction; there has been tunnel work.

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EDITORIAL

There is a Future for Young Men in the Utility Business

DURING the past month two very significant events have occurred which augur well for the possibilities of progress for the younger members of the great public-utility organizations. Two of the larger utilities of California have seen fit to elect to their respective directorates men who have, in effect, grown up in the organization—a radical departure from the old-time method of selecting a director purely on the basis of stock ownership with little or no regard for his knowledge of the problems of the business.

Harry J. Bauer has just been made a member of the board of directors of the Southern California Edison Company. While still attending law school, almost twenty years ago, Mr. Bauer began work in the legal department of the Edison company as a junior clerk. During the subsequent years he stepped up through the various grades of the legal department, finally becoming general counsel for the company.

The Los Angeles Gas & Electric Corporation has just elected F. E. Seaver to its board of directors. Nineteen years ago Mr. Seaver entered the employ of the company as an assistant bookkeeper, working up through the various ranks until he became assistant secretary in charge of stock sales, the position he now holds.

The significance of these two events is brought out further by the fact that in announcing these elections these large organizations have seen fit to lay much emphasis upon the fact that both of these comparatively young men practically have been brought up in the business, the destinies of which they are about to help direct.

June Brides Mean More Electrical Appliance Sales

BETWEEN April and August in California approximately 20,000 couples will pass from single to wedded bliss. In other Western states the number of newlyweds will be as startling. Without entering into a discussion of the reasons for this seasonal activity on the part of county clerks, justices of the peace and pastors the statement may be made that these launchings of the matrimonial bark represent an opportunity to the electrical industry that should be turned into capital. In other words, tomorrow is not too soon to begin planning for a June Bride Campaign.

In California, as in past years, this seasonal

sales activity will be under the direction of the California Electrical Bureau. This organization has sponsored the movement for several years, planning publicity, preparing posters and advertisements and distributing this material to the industry. Announcement has been made that the same procedure will be followed this year. In addition, the co-operative organizations in other sections of the country will follow the same procedure.

The object which these campaigns hope to attain is three-fold. In the first place, it is desired that the impression be made upon friends of the June bride that there is nothing as suitable and useful for a wedding gift as an electrical appliance. This year an attempt is to be made to attract the attention of the buying public to the fact that, irrespective of the month in which the bride is married, electrical gifts are most appropriate. In other words, the sales effort is not to be confined to June alone. Lastly, because every bride (and groom) has anniversaries, the impression is to be made that electrical gifts are suitable for these occasions.

But one criticism has been made regarding this activity, namely, that it tends to put useful electrical appliances into the luxury class by emphasizing them as gifts. This argument should carry no weight because the public already has been sold on the utility of practically all electrical appliances. Certainly the flatiron, toaster, percolator and waffle iron no longer can be classed as luxuries.

Past experience indicates that the industry has not developed fully the opportunity which this season of giving presents. To show the possibilities, it need only be stated that one large electrical dealer in California in 1925 sold more appliances during the month of June than he did during the Christmas season. He did this by properly dressing his windows and by devoting considerable newspaper space to appropriate advertising. His record can be equaled by any dealer or central station that expends a like amount of sales effort.

Secretary Mellon Speaks About the Colorado River

SECRETARY of the Treasury Mellon has cast a new light upon the Colorado River situation. In a letter to the Senate Irrigation Committee commenting upon the Swing-Johnson Boulder Canyon bill he not only opposed the fiscal policy as outlined in the measure but also placed his finger upon the vital question for the determination of Congress

that is involved in this piece of legislation. He asks this question, "Should the United States spend \$125,000,000 for the construction of a power and irrigation project?" He then proceeds to answer his own question in a direct and logical manner. He says:

"I believe that, in general, sound public policy in America, as elsewhere, is to encourage private initiative, and not to have government ownership or operation of projects which can be handled by private capital under proper government regulation. The government operation of railroads in this country was our largest experiment in this line, and a comparison of public and private operation in that field justifies my faith in private enterprise. Canadian and European experience is the same.

"To get the government out of business, whether it be in banks, utilities or monopolies, has become one of the most essential steps to permanent fiscal restoration of Europe, and I am loath to have the United States embark upon enterprises not strictly governmental in their nature.

"The fact that a government can furnish capital at a lower rate of interest is illusionary, if there be taken into account that the public project pays no tax and therefore does not bear its share of the cost of government. It seems to me that if the project is one that can pay its own way, private capital can be found. If it cannot pay its own way, then we should consider whether all the taxpayers throughout the United States should be taxed for the benefit of a part of the country."

In these words Secretary Mellon reiterates the stand of the present administration expressed first in the Republican party platform and since repeated frequently by President Coolidge and Secretary Hoover. With both houses of Congress favorable to the administration despite a radical bloc with no little power, it is difficult to imagine that the Swing-Johnson bill or any other legislation designed to force the government into any form of business will meet with a favorable vote. At any rate those who are close to the situation see little likelihood of the Swing-Johnson bill or any similar measure dealing with the Colorado River passing during the present session of Congress. This leads to the further conclusion that an amicable settlement of the Colorado River situation is still a dream of the future.

Radio Dealers

Should Play Ball

IN many localities a surprising number of otherwise enterprising and up-to-the-minute radio dealers refuse to take cognizance of the efforts of the electric utilities in reducing or removing radio interference. The utilities are spending appreciable sums and in many cases are doing far more than their normal share to co-operate with the users of radio sets. This is necessary, but it would seem that the radio dealers, being the main beneficiaries, at least should not antagonize the utilities.

Innumerable cases are reported wherein radio dealers continue to turn off complaints with the blanket statement, "Oh, it must be caused by one of the power lines in your neighborhood." If not that statement, then one as inane is made; and if not given out by the dealer himself, it is given out by his employees; the effect is the same.

Costly investigations carried out within the past two or three years have proved conclusively that half of all of the troubles bothering the average user of a radio receiving set originates within the set itself, or at least originates on the premises of the customer. These is no way can be charged to the electric utilities, being such things as loose connections, worn-out batteries, faulty tubes and even faulty operation of the set itself, thermostatically controlled household electrical appliances, lamps fitting too loosely in their sockets, and a multitude of other minor ills.

Of the remaining 50 per cent, less than half is traceable definitely to power equipment for which the electric utilities are responsible. This means that less than a quarter of the disturbances interfering with radio reception may be fastened in any wise upon the power companies. The utilities, in general, recognize their responsibility and are exerting themselves to remove the difficulties that are chargeable to their equipment. The final 25 per cent is chargeable solely to natural causes, according to the best radio authorities of the times, and must be expected at least with the present powerful long-distance receiving sets.

Education of the user of a radio receiver will enable him properly to qualify and classify the disturbances that interfere with clear reception and to do his part in eliminating them for himself and for the sake of his neighbor. Those radio dealers who otherwise are progressive would benefit themselves and everyone else concerned if they would step into line, accept their full share of the burden of interference elimination, assist in the proper education of the radio-using public, and stop trying to dodge behind a mythical bush.

Public Relations

Begins at Home

FOR courtesy and service no effort is spared these days by public utility companies. Much money is expended in advertising the idea that the public will receive the utmost in consideration and courtesy in all of its dealings with the company. Pamphlets are issued to instruct employees on the ways in which they should go, and classes are held to drive home the ideal of public service.

This is all fine, and yet there has come this gentle plea from one employee: "In all this service and courtesy," he says, "the management shouldn't forget that its first opportunity to exercise courtesy and service is upon its own employees. Here is a group, more closely associated with the utility than the public can ever be, in daily contact with the company for which they work. These employees are the company's liaison with the public,

for they are a part of the public themselves. Their families mingle with their neighbors and reflect the company's attitude toward them in word and action. Isn't it important that the executives of the company observe the rules of courtesy and service toward these employees that they wish the employees to maintain toward the rest of the world? Surely executives of power companies have a great responsibility in the example they set for those in the ranks, not only in courtesy and tact, but in all conduct which might reflect discreditably upon the organization, were it general. Don't you think that public relations, like charity, should begin at home?"

Be is said that this responsibility is realized by executives as a general rule. Be it said that in most companies those who have failed to act toward their employees as they ask employees to act toward the public are sorry and regretted exceptions to the rule. But the fact that one employee has made this statement is evidence of the fact that the responsibility is one which is deeply important. The executive must be sure that he is not asking of his workers something which he himself is not giving.

Kids and Kites

POTENTIALLY kids, kites and high-tension wires form a deadly combination. Every year at this time there is a total of fatal accidents and costly power outages from this cause. Ignorance may be charged with 80 per cent of the kite-string accidents and experimental bravado with the other 20 per cent. At any rate, it would appear that a campaign of publicity directed to the kite-flying youth would serve to correct the evil. Information as to the serious nature of flying a kite into a high-tension line broadcast at this time would overcome the ignorance of the many youngsters and would frighten most of the bravado out of the few who might have a desire to "see the sparks fly."

Electric Refrigeration Has Bright Future

PROBABLY the most spectacular growth in the history of the electrical industry has been that of radio. Six years ago radio as a commercial factor was unknown. The estimated sales of radio apparatus and supplies for the year 1926 are in excess of \$400,000,000.

Nevertheless, it is believed that the household electrical refrigerator has a future in store for it almost if not quite as great as that of radio. From the World War period until 1923 electric refrigeration experienced a very slow growth. Beginning in 1914 with a total of some six hundred units in operation, there were only 10,000 in 1923; in 1925 this number jumped to 75,000, so that today at the beginning of the year 1926 it has been estimated that there are approximately 142,000 household-type electric refrigerator units used in the United States.

This fact is interesting enough in itself, but what is even more interesting is the potential mar-

ket. Only about one per cent of the 14,500,000 electrically wired homes in the United States today is equipped with electrical refrigeration, and this in turn represents only about one-half of one per cent of the 26,000,000 homes in the country.

Little by little the electrical idea is infiltrating into the home life of the people. As the adaptability of the electrical servant to the solution of domestic problems becomes more fully known the domestic load increases by leaps and bounds. Electric refrigeration is the latest and one of the greatest exemplifications of the blessings of electrical service in the American home.

DISCUSSION

Electric Welding Job of Twelve Years Ago Recalled by Engineer

To the Editor:

Sir—The writer was very much interested in reading in a current issue of the Journal an account by Mr. Shields of Nevada Valleys Power Company, Lovelocks, Nev., describing how a field electric welding job on a valve was completed recently.

The writer has in mind a similar job which was accomplished some 12 years ago at Plant 2 of the Nevada-California Power Company, on Bishop Creek, during his incumbency as superintendent.

A special cast-steel Y having a diameter of 36 x 36 x 30 in., if the writer remembers correctly, operating under a head of 900 ft., failed while in service. Upon its removal from the header it was found to be cracked throughout its length along its horizontal axis, this evidently being a shrinkage crack from the fact that the crack remained open about $\frac{1}{4}$ in.

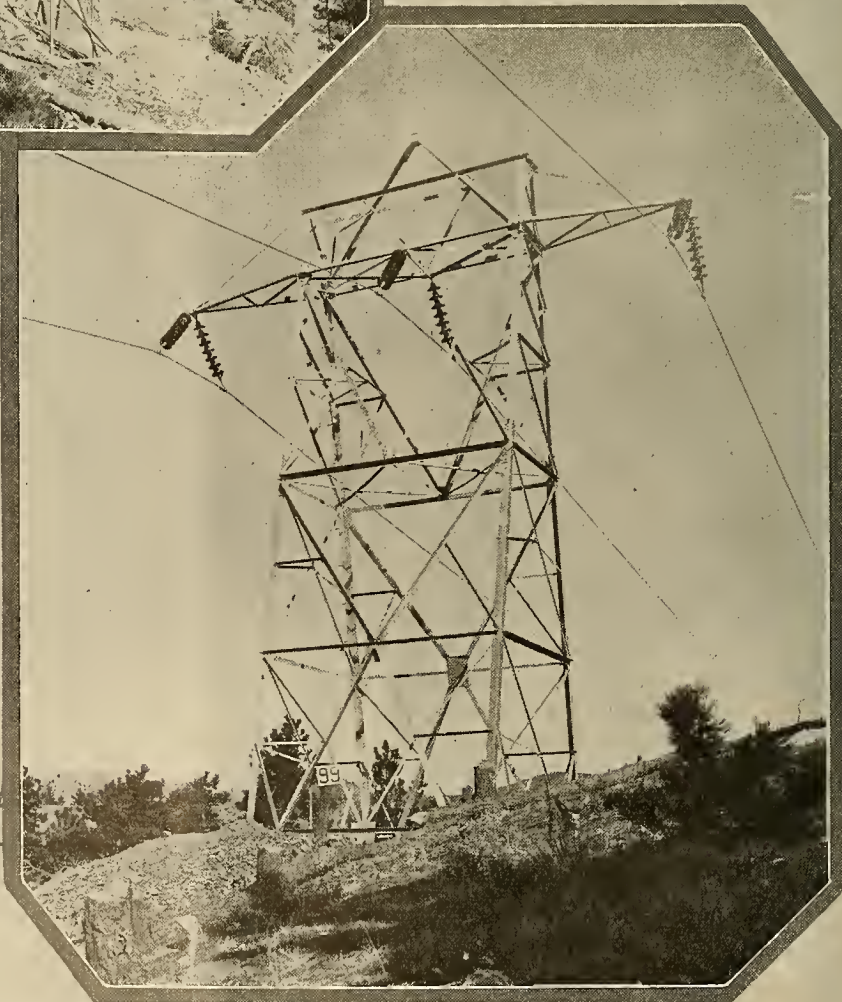
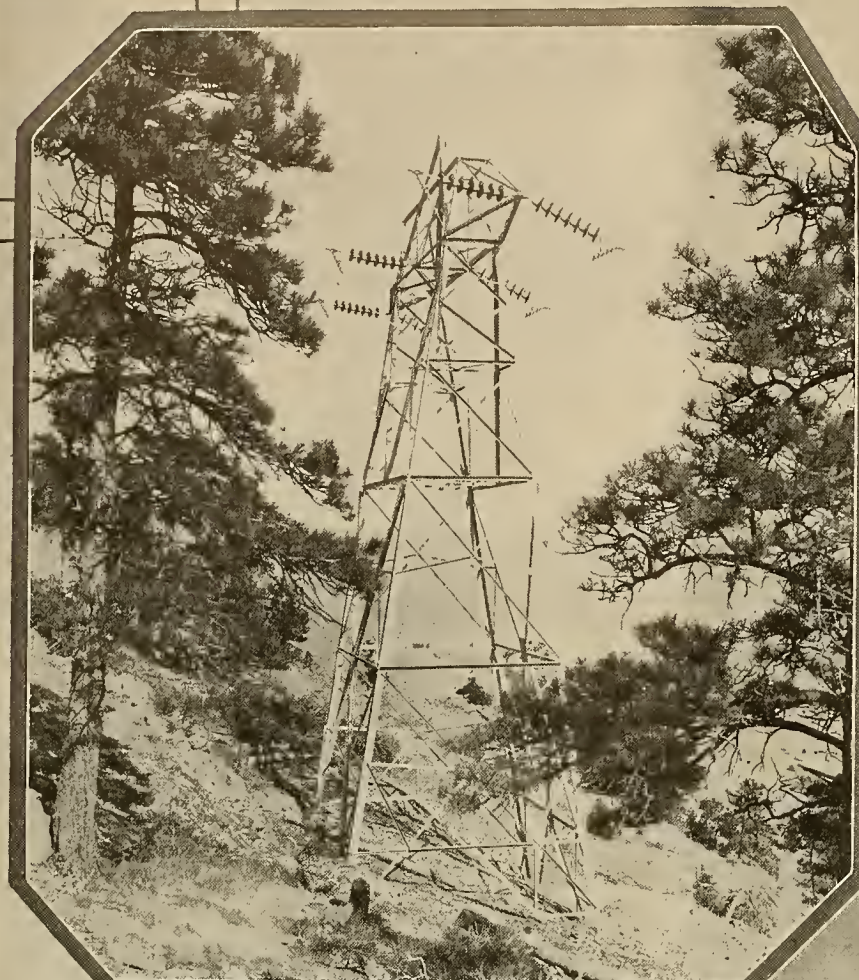
The piece was taken out, a welder sent up from the Pelton Water Wheel Company, San Francisco, and an exciter used to furnish current for the job. A V-shaped trough was chiselled out along the crack and metal was deposited in this and built up slightly thicker than the original thickness of the casting. The job required practically a week to complete. When put back into place there was no evidence of leakage. So far as the writer knows this casting still is in service.

Today such an undertaking would be commonplace, indeed, but 12 years ago electric welding had not reached much more than the experimental stages, and the job in question was considered something of a feat in those days.

D. R. KENNEDY,
Dept. Public Utilities.

Long Beach, Calif.,
April 8, 1926.

TOWERS on the 8-mile transmission line tying in the new Valmont steam plant of the Public Service Company of Colorado with its hydroelectric plant on Middle Boulder Creek of the Platte River. This line forms one side of the triangle of lines running between the Boulder hydroelectric plant, the new Valmont steam plant and the steam plants of the company in Denver. The maximum span on this Boulder line is 2,200 ft. long. The upper photograph shows one of the dead-end towers on this span. The line is operated at 90 kv. It is carried on double-circuit steel poles with pin-type insulators, except at such spans as pictured here. This line is made a link of an interesting balance plan between the company's hydroelectric plant and its steam plant, due to the fact that the hydroelectric plant water storage is used as a source for the condensation basin of the steam plant.



Development of the Electric Dairy Sterilizer in California

By Ben D. Moses

Division of Agricultural Engineering, University of California, Executive Secretary, California Committee on the Relation of Electricity to Agriculture

SHORTLY over a year ago Dr. J. J. Frey, chief of dairy inspectors for California, circularized the inspectors of the state with the question, "What, in your estimation, would be the biggest help in the way of electrical equipment for the small dairy?" Replies were received from various sections calling for different appliances, and, while there were demands for several different pieces of equipment, every letter contained some statement favoring a small electric dairy sterilizer.

The purpose of the sterilizer is to kill the bacteria on the dairy utensils after they have been washed and scalded, rendering them sterile so as to maintain uniformly pure milk with low bacteria count. This sterilization usually is effected by the application of heat sufficiently high to destroy bacterial life.

The state has drafted very definite rules and regulations controlling the operation of dairies selling market milk, and one of these regulations requires that all dairy utensils must be cleaned thoroughly and then subjected to a sterilizing temperature of at least 170 deg. F. for at least 15 minutes. Some dairies increase both the temperature and time beyond the actual state requirements, and all are forced to do some sterilizing. The sterilization in large plants is effected generally by the use of live steam in specially constructed tanks or large cylinders, and sometimes the steam is furnished under pressure. The small dairymen, however, with 12 to 20 cows neither have the space for such a plant nor feel justified in making investments proportionately high.

This sterilization requirement, rigidly enforced by a corps of dairy inspectors, is accomplished in a number of ways on the small farm. Sometimes the utensils are submerged in water in an ordinary wash boiler, tub or vat and kept at boiling temperature long enough to effect sterilization. The boiler may be heated over a wood or coal fire, over an oil or gas burner, or may be heated by electricity.

APPPLICATION of electricity to sterilization in dairies is a fertile field for the industry. In California alone there are 30,000 dairies which offer to the power companies a possible connected load of 120,000 kw. In this article the author deals exhaustively with the question of sterilization and makes several recommendations based upon tests of equipment of this type.

Because of the convenience of gas or oil as fuel as compared with wood and coal, sterilizing units consisting of some type of burner and some type of tank have been developed, and many have been sold to California dairymen within the last two years. While definite costs are difficult to obtain, it seems that the cost of operation of gas or oil-heated sterilizers varies between 4 per cent and 9 per cent per sterilization.

When the sentiment of the dairy inspectors was made known to the California Committee on the Relation of Electricity to Agriculture, it determined to investigate the practicability of electrically heating water for sterilization purposes. It found that about a year ago Fred B. Fair of San Joaquin developed an electric sterilizer using a tank similar to that used for oil sterilization, equipped with an electric heating element. One of these tanks was tested in the laboratories at the University Farm and indicated that the electric sterilizer was full of possibilities. A little later Wellman Bros. of Modesto, who have been active in the development and manufacture of the oil-burner type of sterilizer, took up the study of the electric sterilizer. Since that time these two manufacturers report that there have been approximately one hundred electric sterilizers built and sold to the California dairymen.

That there is a very encouraging potential market for such equipment may be seen by the fact that there are approximately 30,000 dairies now operating in California that are using some type of small sterilizer.

Assuming an average of 4 kw. connected load per sterilizer, with an average consumption of 3 kw-hr. per day, there is then a potential connected load of 120,000 kw. and a potential consumption of 32,850,000 kw-hr. per year, which, at the average of 2 cents per kw-hr. would produce a revenue of \$657,000 per year to the California power companies. Even if only 30 per cent of these potential users ever should materialize, the load is attractive.

Most dairies sterilize every day on a quite regular schedule, and while it is a daylight service the individual loads are small and are spread over a large area, producing a very desirable load factor. The questions which arise in connection with the sterilizer are:

1. What should be its capacity?
2. How large a heating element is best?
3. How much water should be used?
4. How much will it cost the purchaser?
5. What will be the operation cost?
6. How efficient will it be from a sterilizing standpoint?
7. How long will it last?

Reference to many dairymen seems to point to the four-can size as being the most popular up to a herd of possibly 20 cows. First cost for this size should lie somewhere between \$50 and \$100. Cost of operation depends upon the electric rate but probably would not be much more than that of oil or gas-heated sterilizers in California. The size of the heating unit depends upon the efficiency of the tank itself to hold heat, upon the power rate effective at the farm, and upon other electric installations already on the farm.

Several sterilizers have been tested very thoroughly by the committee with the following objects in view:

1. To determine the effect of heat insulation upon the time required to heat and to cool the air within the sterilizer.
2. The effect that the quantity of water has upon the power required and upon the time needed for heating.
3. The effect that the size of the heating ele-

ment has upon the power required and upon the time of heating.

4. The effect of outside air temperatures upon cost and time.
5. The relation existing between temperature within the sterilizer to that within the can and to that of the metal of the can.
6. The practicability of installing an automatic power cut-off, thereby relieving the farmer of the responsibility of shutting off the power.

Fig. 1. shows curves plotted for three types of insulation on the same amount of dairy equipment, using the same amount of water and the 5-kw. heating unit. Curve No. 3 is a time-temperature curve for a single thickness galvanized iron tank and top with no insulation against heat loss. The power was on for 24.64 min., the time of sterilization was about 21 min. and the rate of heating was somewhat slower and that of cooling somewhat faster than either curves No. 1 or No. 2.

Curve No. 2 shows the relation between time and temperature, using an air-jacketed tank and a single thickness galvanized iron cover. In this case 23.8 min. were required to bring the temperature up to 210 deg. F. and the sterilizing temperature of 170 deg. was held for about 27 min.

Curve No. 1 shows a condition for the air-jacketed tank and cover. The power here was on for 21.78 min. and the time for sterilization was a little more than 40 min. These curves show very clearly the importance of proper heating insulation.

Fig. 2 shows time-temperature curves of the same sterilizer comparing the 5 and 3-kw. heating elements. It is interesting to note that while the 5-kw. unit was on for only 22 min. it consumed only 2.07 kw-hr. and the time of sterilization was only about 34 min., while with the 3-kw. element the power was on for nearly 47 min., consuming 2.29 kw-hr., yet the time of sterilization was 47 min.

It is obvious from these curves that by increas-

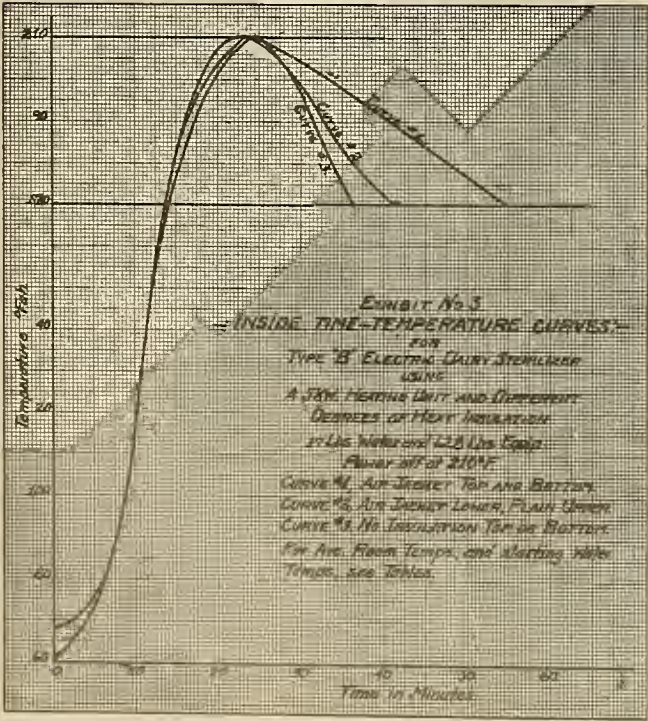


Fig. 1. Time-temperature curves for three types of insulation

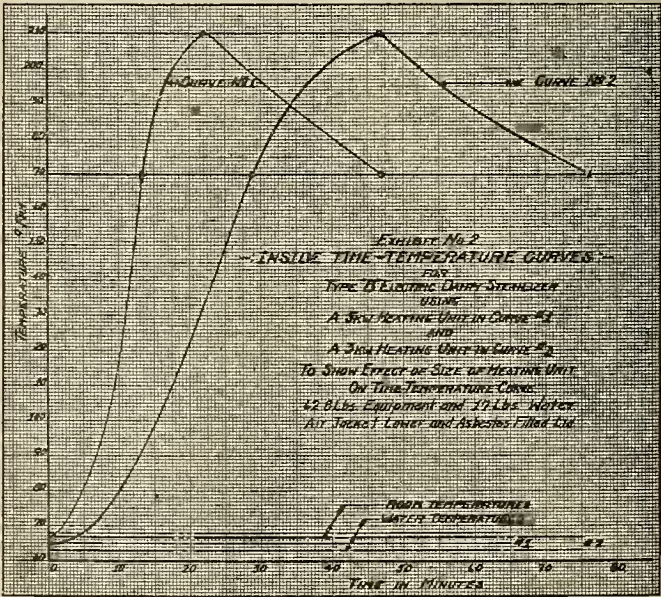


Fig. 2. Time-temperature curve for 3-kw. and 5-kw. heating elements.

ing the size of the heating element the time of heating is diminished very materially and the heating curve rears back. It is also obvious that the cooling curve is not affected, the cooling being dependent entirely upon the construction of the sterilizer and not upon the size of the heater. However, by increasing the wattage, the time of sterilization is decreased and the factor of safety above the required fifteen minutes also is diminished.

The manufacturer, then, should keep in mind the means of properly insulating his sterilizer. He also should recognize that the slope of the cooling curve is dependent upon insulation and very materially effects the efficiency of his apparatus.

The use of a thermostatic switch to interrupt permanently the electric circuit at some such temperature as 210 deg. will operate satisfactorily, provided cooling is not too rapid and that heating has not been rapid enough to decrease the time of sterilization below a safe minimum.

Fig. 3 shows the effect that the amount of water has upon the performance of the sterilizer. The time-temperature curves for these three conditions indicate clearly that the less water that can be used, the less will be the power consumed. Here again, however, is emphasized the relation existing between steepening of the heating curve and the time that the utensils are held above sterilizing temperature.

A careful study of these curves shows:

1. That the heat conservation is of great importance, a reduction in radiation losses making possible the use of a thermostat, and the increasing of time of sterilization without added costs.

2. The slope of the heating curve affects the total time the power is on and the total time the utensils are held above the sterilizing temperature.

The ideal sterilizer, then, would seem to be that one which uses the heating element just large enough, the correct quantity of water, and insulation to the extent that a thermostat cutting out

the power between 200 deg. and 210 deg. F. will result in a minimum consumption of electric energy and will have safe margin of exposure to sterilizing temperature of 170 deg. F.

There are also certain factors entering into the installation of the sterilizer that cannot be overlooked. In the first place, installation should be made in such a manner as to cause no increase in the existing connecting load of the individual farmer. In other words, he should not have to pay any higher demand after installing his sterilizer than he did before. This may call for double-throw switches or similar installation. Secondly, care must be exercised that the farmer who is equipped to approximately the limit will not have to invest heavily in transformer or line-extension alterations. And third, excessive line drop, due to its comparatively heavy load, should be guarded against. Finally, it seems that four parties are called upon to co-operate if the electric dairy sterilizer is to be a success: The sterilizer manufacturer must endeavor

- 1. To hold down first cost.
- 2. To provide efficient insulation.
- 3. Carefully design shape so as to assist in water circulation, minimize "dead" spaces, hold down quantity of water.
- 4. So to select the heating unit as to reduce the expense of operation to a low cost, and yet provide a good factor of safety in sterilizing time.
- 5. To incorporate some kind of satisfactory automatic control.

The appliance manufacturer will be called upon

- 1. To develop a satisfactory heating element—rugged, of long life, simple construction and reasonable cost.
- 2. To furnish switches and controls that can be depended upon and will hold down the fire hazard and reduce danger to operators to a minimum.

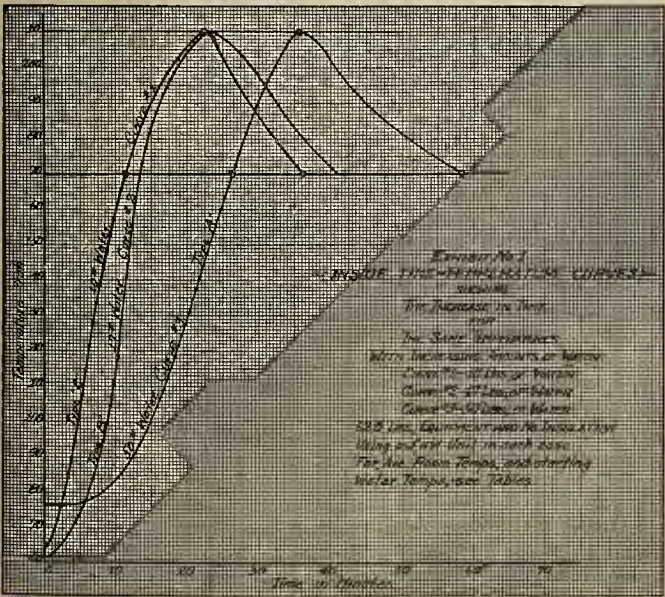


Fig. 3. Time temperature curves for variable amounts of water.

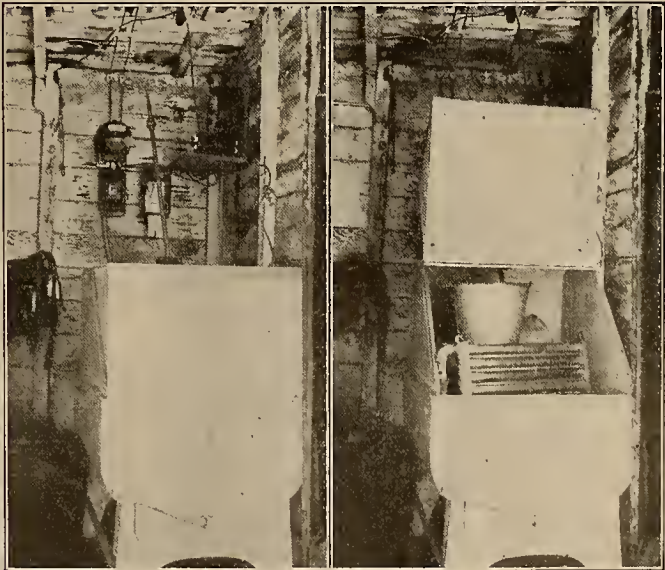


Fig. 4. Recently developed type of electric dairy sterilizer showing open and closed views.

The power companies should

1. Carefully study each installation so as to give the farmer the benefit of the lowest rate schedule.

2. Advise as to proper cut-ins, size of wire, and location of fuse and switch blocks.

3. Warn against carelessness in turning off the current.

The farmer himself will be called upon

1. To follow the manufacturers' instructions.

2. To provide a good place for the sterilizer and protect the parts against abuse.

3. See to it that the sterilizer is grounded, and

4. Realize that heat is the sterilizing agent, that it is generated by electricity, and that electricity flow makes the meter go around.

Advertising and Electricity

By Don Francisco*

LORD & THOMAS, Los Angeles

BENJAMIN FRANKLIN was a man of great vision. I wonder, on that memorable night when he and his son were flying their little silk kite out in the storm, whether he could see the thing which he was collecting in his Leyden jar as we use it today.

It is less than one hundred and seventy years since Franklin's experiments, yet today we use this power to assist in almost every field of human endeavor. It heats our houses. It drives our locomotives. It lights our cities. It makes the deaf hear and the blind see. It even resuscitates the drowning. As soon as this power was captured, controlled and directed, it became so much a part of the daily life of man that now we can hardly imagine a world without it.

Advertising, like electricity, is indefinable. It is a power which moves minds as electricity moves elements. It runs in a current; it has momentum; it is founded on the magnetism of character just as electricity is founded on the magnetism of matter.

The other day, I saw a great crane lift some enormous steel girders to the top of a tall building. Nothing held them to the crane but this fluid power we call electricity. In a moment some one pressed a button somewhere and the girders fell. The power had been released. The big steel surface of the crane was, in itself, helpless to retain them.

The other day I was looking through the pages of an old magazine and I came across an advertisement long forgotten. I recalled the day when the name of the thing there advertised was a household word throughout the length and breadth of the land. A few years ago some one had pressed a button somewhere. The true power of advertising had been shut off. The maker tried everything he could to lift the name again, but his

advertising was gone as completely and permanently as the power of the magnetic crane.

Concentrating a message into an advertisement is much like charging a Leyden jar. A man never fully realizes what his undertaking is until he begins to put his mind on paper. When one begins to picture a thing as he wishes the world to see it, he has taken the first step toward making the thing as he would have the world know it.

Advertising is that electrifying power which takes these vague notions we have and changes them into policies we are willing to fight for.

Advertising is the power which electrifies the salesman, the wholesaler, and the dealer into a spirit of service beyond the mere sale.

Just as in electricity Franklin proved the power of points to conduct, Volta demonstrated the ability of the current to travel, Faraday discovered the power of currents to rotate, and Edison turned the spark into a steady light—so today energetic advertising men are giving their lives in an effort to add little by little and step by step to the world's knowledge of this great omnipresent power which we call advertising.

New Ductile Weld Methods Developed

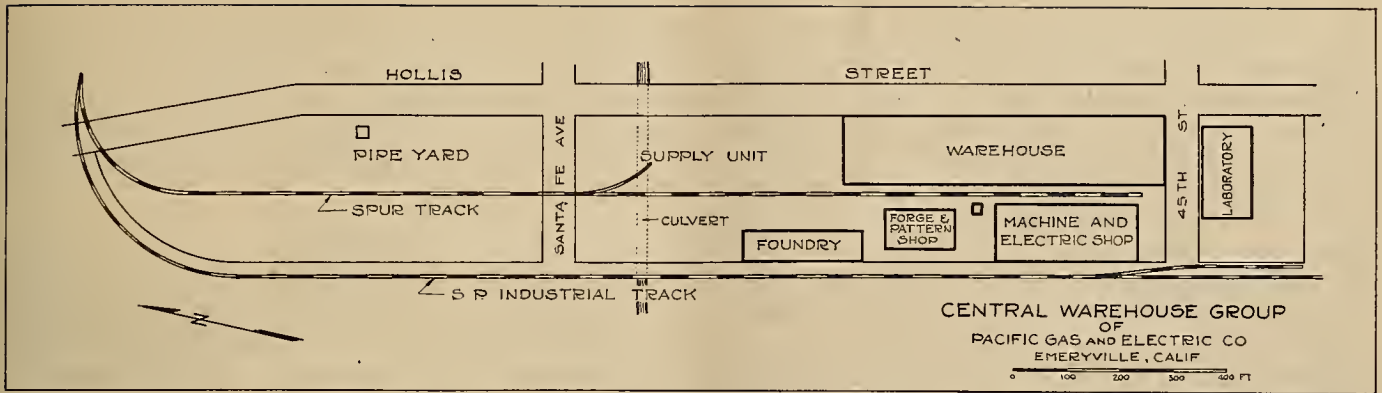
ALMOST simultaneously, two methods for producing ductile welds have been developed by research scientists working in different laboratories, far apart. Both of the methods, similar in some respects, mark a decided step in the utilization of the heat of electric arcs in the joining of metal parts or the building of metal structures. One was developed in the Schenectady research laboratory by Dr. Irving Langmuir; the other was developed in the Thomson research laboratory at Lynn, Mass., by Peter Alexander, both of the General Electric Company.

In both processes, air is excluded from the metal by means of a bath of hydrogen or other gas. The formation of oxides and nitrides in the weld metal thus is prevented, and the fused metal is as strong and ductile as the original metal.

In brief, the method developed by Dr. Langmuir is to pass a stream of hydrogen between two electrodes. The heat of the arc breaks up the hydrogen molecules into atoms. These combine again a short distance in front of the arc into molecules of the gas, and in so doing liberate an enormous amount of heat so that much higher temperatures can be obtained with this than with the usual welding methods. Since atomic hydrogen is a powerful reducing agent, it reduces any oxides which might otherwise form on the surface of the metal.

The process developed by Mr. Alexander is based on the utilization of the chemical and physical properties of hydrogen and other gases in their molecular state. This process aims primarily at the prevention of the formation of the nitrides and oxides in the arc-deposited metal that limit the ductility of the usual arc welds.

*Statement before Los Angeles Electric Club, Los Angeles, March 8, 1926.



New Central Supply Unit of the Pacific Gas and Electric Company

By R. I. Myerholz

Assistant Engineer, Division of Civil Engineering, Pacific Gas and Electric Company.

TO EFFECT a centralization of supply department activities the Pacific Gas and Electric Company in 1924 decided upon the construction of a central supply unit. At such a location the warehousing, manufacturing, repairing, checking and distributing of the large quantities of materials and equipment used annually for plant maintenance and in new developments could be handled more efficiently. Located in the Emeryville industrial district the plant consists of $12\frac{3}{4}$ acres of land adequately supplied with transportation facilities for the distribution of the materials to the different divisions of the company's extensive system.

The group consists of three major divisions, namely, a pipe storage and wrapping yard, a warehouse and shop unit, and a laboratory. The laboratory is a bureau of the engineering department and is not connected with the supply department other than that the testing of materials and equipment carried on by it bear a direct relation to those

maintained at the supply warehouse. It was deemed advisable, therefore, to have the two located adjacent to each other. Each major division is located on a separate unit or area, as the property is divided into three parts by two cross streets.

Spur track facilities are very good. There is an industrial track along the entire west side of the property and the company has constructed a spur extending the length of the pipe yard and supply-department units at their approximate center. The laboratory is served by a spur from the industrial track.

One of the most valuable and important features of the property is that the yard and floor levels are about 4 ft. above the street and railroad grades. This permits the use of depressed spur tracks to establish loading docks at car floor height, greatly facilitating the handling of materials on and off the cars, as well as cutting down handling costs. This feature made it neces-



Fig. 1.—Office portion of warehouse.



Fig. 2.—Front of warehouse building

sary to construct retaining walls about the property, and along each side of the spur tracks. A gravity-section concrete wall was used for this purpose where the wall height was less than 4 ft.; reinforced concrete T or L-section walls were used for greater heights. The walls along the boundary of the property are surmounted by a link-chain fence, the posts set directly in the wall. The fences are topped with four strands of barbed wire on out-riggers. Suitable gates are placed at road and railroad entrances into the property.

A creek channel 30 ft. wide and 12 ft. deep extended across the property at one point in the supply department unit. An old 12-in. sewer line was buried at one side of this channel which carried with it a 6-ft. easement. Unless this channel could be filled in, the yard area would be reduced by approximately 10,000 sq. ft. In view of the value of the land it was deemed advisable to construct a culvert that would carry both the stream flow and sewer line and thus reclaim the area above. A double box-culvert was constructed of 7-ft. square barrels. The sewer was laid on the flow line and surrounded with a lean concrete jacket, thus making it accessible at all times without interfering with the operations in the yards above and without the necessity of tearing out any of the culvert structure.

Pipe Yard

The pipe yard, situated on the north unit of the group, is used for the storage and soil-proofing of the gas and water pipe used by the different branches of the company. All wrought-steel pipe before being used is soil-proofed with a coating of asphaltum and roofing felt especially made for this purpose. Special machines are used to do this work. Prior to the establishment of this centralized equipment this work was done at the different points where pipe was being used. This old system required the transporting of the equipment from one part of the system to another. It has been found, however, that wrapping the pipe at a central point and the subsequent distribution to the point of use materially cuts down the cost; also the process is continuous and ex-

perienced men can be maintained to do the work. Still another advantage is that there always is a stock of pipe available and shipments can readily be made on short notice. In conjunction with the pipe yard three pipe-fitting testing machines are used to test all pipe fittings before shipping them to the point of use.

Warehouse

Warehousing, manufacturing and repair units are situated in the buildings on the central area and make up the supply department unit. This unit consists of five buildings, each designed for the special work for which it is intended. This unit covers 301,676 sq. ft., with a ground-floor area in the buildings of 129,352 sq. ft. The yard area adjacent to the buildings is paved with concrete and water-bound macadam. Suitable concrete loading and unloading platforms 12 ft. wide extend along either side of the spur track above mentioned. These platforms also are used as a runway for transporting material from one building to another. They are of reinforced concrete 6 in. thick. The wearing surface was cast monolithically with the base and is treated with a metallic hardener to prevent excessive wear and dusting. Yard drainage is provided by an underground system connected with the culvert mentioned above.

Warehousing is carried on in a building 130 ft. wide by 600 ft. long and with a second floor 9,100 sq. ft. in area over the central portion for office purposes. The main floor is used for general storage and is equipped with steel bins for the storage of small materials. The floor is laid out with runways, and the material is transported over these by means of electrically driven trucks and stackers. A dock is situated at the ends of this building for the receiving and shipping of materials. These docks are of sufficient size to accommodate three trucks simultaneously.

Executive and accounting departments of the supply units are accommodated on the second floor of this building. This portion of the building is steam-heated with a low-pressure vapor system. The boiler and vacuum pump are on the main floor below.



Fig. 3.—Laboratory building.



Fig. 4.—General view of shop buildings.

The manufacturing and repair division of the supply department is housed in three buildings to the rear of the warehouse and on the opposite side of the spur track. The machine and electrical shop, the largest of the group, is 108 ft. long by 264 ft. wide and is equipped with two traveling cranes of 10 and 20-ton capacity, the smaller one in the machine shop and the larger one in the electrical shop. The machine shop is equipped fully with lathes, shears, punches, presses, and other machines necessary for manufacturing switches, junction boxes, and for reconditioning worn machinery.

The electrical shop is equipped with winding machines, coil-varnishing rooms, and drying ovens for the manufacture and repair of motors, transformers, and other electrical equipment. An oil filter for filtering transformer and switch oil also is installed. Two 5,000-gal. oil storage tanks buried beneath the insulator-storage area are connected to the filters by a suitable pipe system. The electrical testing department is located in this shop and is equipped with the necessary transformers, regulators, and switchboards for testing all the electrical equipment built and repaired by the electrical department as well as that purchased from equipment companies. Adjacent to this shop is a concrete paved area 50 x 108 ft. in size for insulator storage and testing.

To the north of and adjacent to the machine shop are the forge and pattern shops housed in an 80 x 120-ft. building. The forge shop contains the regular blacksmith equipment and the electrical and oxyacetylene welding departments. Equipment for electrical welding consists of two motor-generator units of 60-90-volt, 200-amp. capacity, supplying current for the d. c. welding. A 440-volt single-phase a. c. butt welder also is provided. The welding-current outlets are of the interlocking switch type, thus safeguarding the workers.

The pattern shop adjoins the forge shop, separated from it by a fireproof wall. This shop is equipped fully with the most modern tools for pattern-making. Steel shelving provides storage for all active patterns.

The foundry is to the north of the pattern and forge shops in a 60 x 220-ft. building. All castings of bronze, brass, copper and iron used by the supply department are made there. The shop is equipped with an iron cupola of 3,000-lb. capacity and with three oil-burning brass furnaces. A 5-ton traveling crane is provided in the iron foundry. A portion of this building provides storage for scrap copper, brass and aluminum.

All of the shop buildings are provided with high and low-pressure illuminating gas, compressed air and electric power. The outlets for each are located conveniently in the shops at points accessible to the different kinds of work that are being carried on. All wiring is in conduit, and the power control is accomplished from power panels located adjacent to each group of machines controlled. All machines in the shops are direct electric drive.

Power for the group is supplied by an outdoor transformer station consisting of three banks of transformers of the following capacities: 290-kw., 3-phase, 220-volt. for the power circuits; 182-kw., 220/110-volt, 3-phase for the lighting and power purposes; 60-kw., 3-phase, 440-volt for power used by the electric locomotive crane; 15-kw., single-phase, 440-volt for weldings and 125-kw., single-phase, 2,300-volt for testing purposes. Distribution of the power is controlled by a switchboard adjacent to the transformer station and housed in a small fireproof building located between the machine and forge shops. The 8-in. centrifugal fire pump also is in this building directly connected to a 75-hp. motor. This pump is capable of boosting the pressure in the fire mains to about 125 lb. per sq. in.

Laboratory

The laboratory building and yard make up the third unit of the group and are located on the block to the south of the warehouse building. The building is 98 x 170 ft. The exterior is similar to the other buildings of the group, but the interior has been constructed to meet the highly specialized work carried on by this department. The testing



Fig. 5.—Pipe and supply-unit yards.



Fig. 6.—Depressed spur track facilitates loading.

of all materials used on the company's construction and repair work is taken care of in this unit. Special research work is also carried on.

The several laboratories making up this unit are the standardizing research, chemical, physical, concrete, instrument repair, machine shop, shipping room, and the large general test room. These laboratories all are on the main floor and are equipped fully. The main test room is 32 x 98 ft., with an average height of 25 ft. It is equipped with a 15-ton traveling crane, and also is provided with a mezzanine floor for the storage of miscellaneous materials. The heating plant and main switchboard for the building are in this room.

The different laboratories all are connected by means of a system of covered trenches through which any future piping or electrical wiring can be installed without altering the building in any way. A separate transformer station provides power for this unit; it is in the yard at the rear of the main test room. It is connected to the main switchboard through conduit and the trench system. The yard of this unit also is surrounded by a chain-link fence similar to that of the supply department.

General

Much study was given toward the determination of the type of building which would be the most suitable for a group of this nature. After due consideration of all types the class C type with concrete walls and timber frame was decided upon as being best fitted to meet all of the controlling conditions.

Simplicity of construction, quality of appearance, durability and economy were the prime factors considered in the selection of the proper building type. The concrete of the exterior walls was poured against the rough side of the form lumber, giving a pleasing wall surface. The walls are not plastered, and hence in order to make them as waterproof as possible hydrated lime or diatomaceous earth was added to the concrete to give a very dense and easy-working mixture. These materials also gave a concrete that very easily could be worked into all sharp angles and recesses, giving

sharp and unbroken lines to the architectural details of the buildings. Form work was well rendered by the contractors, and the finished walls have the appearance of a special plaster treatment.

Roof trusses and interior framing are of timber. The trusses rest upon columns built into the exterior walls. The second floor of the warehouse is of laminated mill-type construction with a T & G wearing surface. This type of floor insures a high resistance to fire and thus cuts down that hazard.

Concrete was used for the floor of the warehouse while that of the electric and machine shop is of a redwood block. The forge and foundry floors are a special sandy clay, well rolled to form a uniform surface. In the pattern shop a double wood floor has been provided.

Lighting of all the buildings is accomplished by means of windows and skylights. The relation of floor area to lighting area was maintained in the ratio of approximately 4 to 1. This ratio was found to give the most efficient working light. Artificial lighting in the buildings was designed to give the most uniform working light possible. Offices and laboratory buildings are equipped with Glassteel diffusers, which give a semi-indirect lighting; shops and warehouse are equipped with dome reflectors for direct light.

All buildings are protected by a fire system directly connected to the fire pump mentioned above and also to the city mains. Thus ample protection is assured at all times.

Grounds about the laboratory and the parking area between the sidewalk and the warehouse building have been beautified by lawns and low-growing shrubs; climbing vines are placed against the building walls. This arrangement breaks up the cold monotony of an industrial district and makes it a more pleasing place in which to work.

The buildings were designed by the engineering department of the company and the construction was handled by contract. The period of construction extended over fifteen months but was carried on in such a way that the use of the group was made possible about six months after construction started.

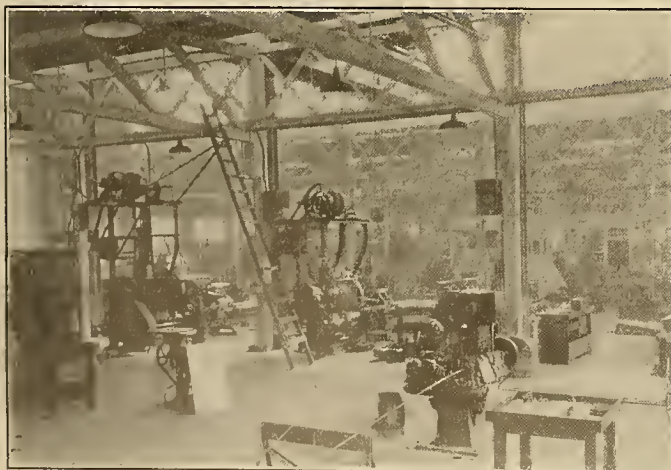


Fig. 7.—Interior of machine shop showing typical structural framing.

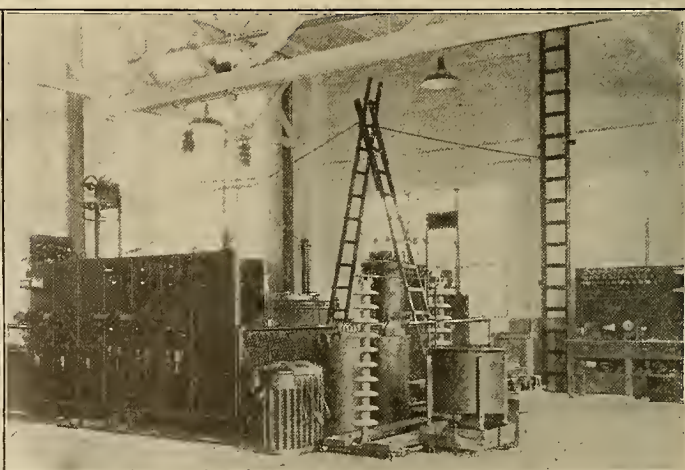


Fig. 8.—Showing testing board, transformers, regulators and other equipment.

The Making of a Municipal Electrical Code

By L. W. Going*

Chief Electrical Inspector, City of Portland

BEFORE attempting to explain what a municipal code should be I am going to tell a story which aptly illustrates what a municipal code should not be. It is related of an eminent diplomat that on one occasion he spent a long time writing, revising, and correcting an important letter, and then submitted it to a friend with a request for his opinion of it. The friend read and re-read it, and at length remarked, "It is beautifully written and seems very clear, but, if you will pardon my saying so, I cannot discover from it exactly what you mean to do." "Ah, thank you," exclaimed the author, "it is a perfect success," and at once signed and despatched it. Indefiniteness was the result he had labored for, a result possibly of value in a diplomatic note but a very undesirable though not uncommon quality of codes in general. Those responsible for the administration of codes will agree that, of all the qualities of a municipal code, definiteness is at once the most desirable and essential. Rules may be rigid or they may be lax, but, if they are to be workable, they must be definite.

This paper is not intended as a finished exposition on the subject of code-making. It is intended merely as a suggestion of the more essential features of a municipal electrical code and to point out wherein such a code may differ from the National Electrical Code.

Purpose of a Municipal Code and Essential Features

A municipal electrical code is evidence of recognition by a municipality of its responsibility for unsafe electrical conditions. The acceptance of this responsibility by municipalities has become so widespread that today the principle of city regulation of electrical wiring and equipment seldom is questioned. The National Electrical Code cannot, unless adopted as an ordinance, be enforced in uninsured buildings and, even in insured buildings upon the payment of a stipulated charge defective electrical work is permitted to remain. Responsibility for unsafe electrical conditions therefore must be assumed by the municipality, and to meet this responsibility is the purpose of the municipal electrical code.

It is not possible in a brief of this kind completely to cover the essential points of a municipal code.

THE author, being a recognized authority on the subject, outlines some of the elements that should be incorporated in a municipal code and explains the necessity of such codes as supplements to the National Electrical Code.

Such a code should, however, make adequate provision first, for the assignment of the duties of inspection to some designated public official, or for the creation of the office of electrical inspector; second, for the licensing of electricians and the issuance of permits; and third, for standards of materials and methods of construction,

equal to or better than those prescribed by the National Electrical Code.

Licensing Contractors

Second only to the creation of an adequate and competent inspection force is the plan for licensing electricians. The licensing provision holds the contractor or worker strictly accountable for his acts and tends to weed out, so far as can be accomplished through legislation, incompetent and dishonest contractors. The question of licensing seems to be a weak point in the electrical control and inspection in the majority of codes today. Many localities are without a license law, and in others the laws are unsatisfactory or inoperative.

For over ten years in the city of Portland the licensing provision has been in successful operation and has proved an effective barrier to the entrance into the local field of transient, irresponsible contractors. Enforcement of the license law in this city has been a chief factor in building up a class of contractors of unquestioned standing in the community—men who not only are familiar with the code requirements but who take pride in installing electrical work of the highest standard. The slogan in Portland is not simply, "Do it electrically"—it is, "Do it better electrically."

Another valuable feature of the license law pertains to the enforcement of the code rules, which is simpler when electrical work is confined to a limited number of competent contractors. This results in fewer corrections and greater speed and efficiency in inspection work. To make the license law 100 per cent effective the code should provide that no electrical wiring or equipment be installed without a permit nor placed in service without a certificate of approval.

The standards of materials and construction form a most important part of the code. In the opinion of some, the standards of construction should not be included in the ordinance; in other words, the ordinance should be merely an enabling act, with

*From a paper presented before the convention of the Northwest Association of Electrical Inspectors, Portland, Jan. 11-12, 1926.

suitable restrictions and penalties providing for the publication of desirable standards of construction by some responsible official. In support of this contention they cite the difficulty of passing an ordinance prescribing standards of construction as well as the difficult task of bringing about the enactment of amendments which may be urgently demanded by advances in the art. The State Electrical Code of Oregon is an example of the use of the enabling act while the City Code of Portland is an example of legislation prescribing standards of construction. The determining factor in the choice of methods in any case depends upon local conditions. If the city charter is so drawn that authority to formulate codes can be delegated to some responsible official, then the best procedure is to make the municipal ordinance an enabling act.

Standard specifications for materials and devices are prescribed by the Underwriters' Laboratories and every municipal code should, and usually does, contain a provision requiring that all materials, devices, and appliances intended for use on light or power circuits shall conform to these standards. It is unfortunately true, however, that unapproved devices are being installed daily and used in cities which have this provision embodied in their codes, and manufacturers, both foreign and domestic, still continue to do a thriving business in cheap, unsafe devices. This state of affairs cannot and will not be remedied until municipal authorities awaken to the fact that they and they alone are responsible. Certainly the unsuspecting public cannot be held responsible when devices which meet no standards of safety freely are offered for sale by merchants who, in most instances, are as equally unacquainted with electrical hazards as the public. Are we then as representatives of the city government negligent in our duties as protectors of the public's life and property? Can we afford to delay longer attempting means of combating this evil tendency? Can we justify our failure to undertake the elimination of a situation which daily is growing more serious because of the rapidly increasing uses of electricity?

The remedy does not reside in the mere definition of the term "approved" nor does it reside in the code requirement that all electrical devices must be approved. The evil is too deeply rooted for that. The only effective remedy, and one which has been successfully pioneered in the city of Portland for a period of several years, is the code provision for licensing dealers selling or offering for sale electrical materials and devices, and including in this license the requirement that dealers restrict their sales to such devices as comply with the standards of safety prescribed by the Underwriters' Laboratories. There is nothing complicated about the dealer's license provision as contained in the Portland Code—nothing that cannot be adopted and enforced in other cities. The more cities that get behind this movement, the easier will its enforcement become. If universally adopted it would eliminate the manufacture of cheap, unsafe equipment.

Electrical materials not only must be approved—they also must be properly installed. The methods of installation form a most important feature of a municipal code. It is not within the province of this paper to advocate or suggest the type of wiring method desirable, which is a matter resting entirely with each community. A type of wiring acceptable in one community may not meet the standard desirable in other communities. Some cities are more progressive than others in this respect, the general tendency being toward the adoption of the all-metal standard, viz., conduit, armored cable or metal raceways. The gradual adoption of higher standards of construction is largely a matter of education, not only of the electrical contractor, but of the architect, builder and owners as well. We will have with us always the opposition of those who predict the ruination of the industry through the establishment of higher standards of construction—a prediction not founded upon fact, at least when viewed in the light of past experience.

The standards of construction included in a municipal code should aim for the accomplishment of three things. First, they should be adequate to meet all conditions that arise in the field of electrical construction so that it will not be necessary for contractors to substitute methods of their own. Second, they should provide for standardized methods as far as practicable without sacrificing flexibility. Third, the methods of installation, including circuit and feeder capacities, size of switches, cutouts, etc., required in various installations should be defined so clearly as to leave no doubt in the contractor's mind as to what is necessary to satisfy the requirements of the ordinance.

Standards of construction which meet the above requirements will place all electrical contractors upon a common basis so far as the class of construction on which they submit bids is concerned, and a municipal code that accomplishes this purpose cannot fail to receive the hearty appreciation and effective support of the local electrical fraternity.

All municipal codes prescribe standards of construction which have for their basis the requirements of the National Electrical Code, but it seems to be a common characteristic of municipal codes to include special local rules. Does this indicate a lack of faith in the National Code? Is the tendency toward special local rulings due to the lack of something in the National Code that is essential in a workable municipal code, or is it merely exaggerated local pride which prompts the making of special local rules?

The charge has been made that it is wasteful of time and effort for local code committees to attempt to work out local electrical rules varying from the national standard and from each other; that the making of rules governing electrical installations is a function of national, not local, authorities; that many and diverse electrical codes in different localities inflict a real waste upon the electrical industry and upon the public. The work

of drafting a code cannot be classed as a pleasant diversion. Experience has taught us that a good municipal code can result only from long and patient labor, contributed by busy men of wide experience who can ill afford to waste time upon useless endeavor. There must, therefore, be some underlying reason for this local effort.

The Origin and Justification of Special Local Rules

If you will trace the history of the average municipal code back to its inception you will find that, with the exception of necessary administrative features, it is identical with the National Code in effect at the date of its passage by the council. Then shortly after the birth of a code, some contractor discovers or invents a method of installation which, while still within the law, omits something deemed essential in an installation that is to be permanently safe and satisfactory. Competition soon forces other contractors to adopt the same methods and the practice becomes general. The evil practice referred to may consist of poor workmanship, or inadequate feeder or circuit capacity, or the use of wiring methods not suitable nor desirable in the type of building that is being wired. For instance, the National Code recommends that "special attention be paid to the mechanical execution of the work"; a municipal code must demand it. The National Code specifies the amount of current a given size wire will carry safely, but fails to provide any rule by which the circuit and feeder capacity may be determined at the time of installation; a municipal code must provide definite minimum requirements relating to circuit and feeder capacities in buildings in order that adequate capacity will be available when the installation is completed and placed in service.

Contrary to prevailing opinion, municipal authorities and the electrical industry in general do feel more or less responsible for the trust which the public has reposed in them—a public which is not electrically trained and to which electrical wiring and equipment are merely incidents. This sense of responsibility dictates that some action be taken to maintain the safest and best standards of construction and to curb any attempt made to lower such standards. So a local code committee is formed and this committee, working in conjunction with the city inspector, drafts special rules to overcome this condition. They do this, not because special local rules are desirable, but because the rules of the national standard fail to provide a satisfactory remedy. The conditions calling for special rules frequently arise and eventually are incorporated as a part of the municipal code. This, then, is the point of departure from the national standard.

The question naturally arises, are these special rules justified? Are they of sufficient importance to justify a departure from or addition to the national standard? Possibly not, if measured strictly in terms of fire hazard. But the city ordinance of today is becoming more than merely a set of minimum requirements; it is coming into use more

and more as a standard which prescribes the best construction methods by engineers and contractors who not infrequently use the code as a substitute for specifications—a use for which it was not originally intended but nevertheless a use which must be recognized by the compilers of the code. When an installation passes city inspection it is assumed by the public to represent the latest and best methods available. This presumption or trust is not entirely justified, but it is so well founded that municipal authorities and local code committees are forced to give it recognition when drafting a code.

Putting the Code to Work

After the code has been compiled and edited in the exact form which the law is expected to assume the next problem is to put it across. If the personnel of the local code committee has been selected wisely, little difficulty will be experienced. It is very important that members selected to serve on a local code committee represent the views and opinions of the various groups or individuals directly affected. Failure to do this may mean the difference between success and failure. Team play is essential. No enterprise can be successful unless all individuals or groups are animated by a common purpose, nor can an enterprise be successful if any individual or group attempts to play a lone hand.

Antique Electric Lamps Discovered in Colorado

ONE of the earliest types of incandescent lamps was salvaged recently from the meter loading test board in the Leadville office of the Public Service Company of Colorado. The board was dismantled to permit the installation of a later model board.

Details regarding the historical value of these lamps of which there are five, were revealed by E. L. Siekmann, district manager at the Leadville office in a letter to Messrs. Clare Stannard, C. A. Semrad, Guy W. Faller, V. L. Board and G. B. Buck, officials of the Public Service Company in Denver, who were presented with these valuable antiques of the electrical world.

The lamps are actual examples of Edison lamps as manufactured in 1884. One of them is owned by the Smithsonian Institution and it is described in detail on page 56 of the Smithsonian Miscellaneous Collection, publication No. 2717.

About two years ago, according to Mr. Siekmann, the company was called upon to investigate the lighting in St. George's Episcopal Church in Leadville. Four similar lamps were then found installed in the ceiling, some sixty feet above the floor level, where they had been in operation since 1884, according to labels found on the lamps. The long years during which these lamps remained unchanged in the church do not indicate that they had an abnormally long life, inasmuch as the church is used only once a year for services.

CENTRAL STATION CONSTRUCTION OPERATION AND MAINTENANCE

Pole-Life Extended by Full-Length Creosoting

Vacuum-Pressure Process Accomplishes Deep Penetration of Preservative and Also Bleeds out Surplus

By R. S. MANLEY, President, Texas Creosoting Company, Orange, Texas.

Engineering by imitation too often controls the decision as to the species and kind of pole to be used.

The possibility of securing great returns from a careful study of all of the facts concerning all of the various kinds of poles is overlooked. The expenditures for pole lines constitute such a large percentage of the total costs that once this fact is understood the demand for more comprehensive study becomes insistent.

It may seem to be an inconsequential matter to decide on the type of pole to be used, but as a matter of fact such decision is an important and far-reaching one. Consideration and determination of the following is necessary:

1. Weather conditions in the country to be transversed.
2. Ice, snow, sleet and wind loads.
3. Wire load.
4. Effects of decay fungi.
5. Presence of wood-destroying insects.
6. Fiber strengths and the modulus of rupture of various woods.
7. Chemicals which when injected into the wood will most completely defeat the decay fungi and the wood-destroying insects.
8. Amount of preserving chemical to be used and the most efficient method of application.
9. How the wood shall be prepared for treatment and how seasoned.
10. Where and what size to make the cuts and holes for the reception of crossarms.
11. Whether to use pole steps or not.
12. First cost.
13. What the expectant life should be.
14. How much per year will each class of pole under consideration cost when spread over a long period of, say, 50 years.



Fig. 1. Typical case of ground rot on untreated pole.

Every person is familiar with decay as illustrated in Fig. 1., but few realize that all decay is unnecessary and constitutes one of the greatest waste problems of our day. The Bureau of Agriculture states that "wood properly creosoted will last indefinitely." Wood-boring insects insidiously destroy poles, crossarms and in some places even furniture, never appearing on the surface. They have an "inside job," as may be seen in Fig. 2, representing actually what is going on inside of large numbers of poles in California.

The yellow pine pole creosoted for its entire length has gained in favor among all engineers at a very rapid rate. This is due to the low cost per year, the permanence of the installation, the absence of service interruptions, the immunity from attack of fungus organisms or insects and the universal record of great length of life. The Forest Products Laboratory in its bulletin issued April 6, 1923, recommends the following values for modulus of rupture of various pole woods:

Pine—southern yellow, dense.....	7,300
Pine—southern yellow, sound.....	6,300
Pine—lodge pole.....	4,500
Cedar—western red.....	4,300
Cedar—western white.....	3,400
Douglas fir—dense.....	7,300
Douglas fir—not dense, coast region.....	6,300
Hemlock—western.....	5,600

These strength data, taken in conjunction with the fact that the strength of pine is not diminished appreciably during the creosoting while the fir group usually requires such high steam temperatures to effect penetration of preservatives that the strength is lessened materially, make pine the ideal pole wood.

The holiday season of 1924 with its sleet and ice storms through the central Mississippi Valley in which a total of more than 60,000 poles were lost, of which less than 50 poles were creosoted pine, convinced all engineers who knew the facts that the most economical pole in the long run is a pine pole properly creosoted for its entire length. Fig. 3 shows that the breaks sometimes occur at points other than the ground line. A creosoted pine pole retains its strength continuously; its original effective diameter remains undiminished. Take the New Orleans-Mobile lead of the Bell company; built in 1897, inspected in 1925 and practically every pole 100 per cent sound. Poles were removed and re-used in other lines in order that the line might be rebuilt for heavier service. Strength



Fig. 2. Examples of destructive work of *Termites Bellicosus* on California poles, arms and pins.

tests of these 28-year-old poles showed no practical change in strength.

Also it should be remembered in connection with this record that the machinery and processes for creosoting have been improved greatly in the intervening years. If the poles treated in 1897 were practically 100 per cent sound in 1925 and fit to be re-used in a smaller lead with the expectation of many more years of life, how long is it reasonable to expect the modern creosoted poles to last? Certainly with modern methods 50-year life should be a conservative estimate.

Steps taken in the preparation of creosoted pine poles may be interesting to those who are not familiar with the processes. Southern yellow pine poles are found in the forests extending from Virginia to Texas. They grow straight and strong, though seldom reaching a usable length of more than 90 ft.



Fig. 3. "Poles do not always break at the ground line."

During the seasoning the pine poles are stacked on creosoted skids, each tier separated from adjacent tiers by creosoted spreaders to eliminate the chances of incipient decay during seasoning. When opportunity does not



Fig. 4. Poles loaded on tram cars ready for entry into the vacuum cylinders.

exist for air seasoning, poles are seasoned artificially in the cylinders by the use of low-pressure live steam and high succeeding vacuum. Time required for this artificial seasoning varies directly as the moisture content and cross-section of the poles vary. Temperatures used in this process never exceed 275 deg. F. so that the wood fiber is not injured.

When air seasoning has been completed the poles are roofed, framed and bored as directed by the customer and then loaded into tram cars, Fig. 4. The load is cylindrical so that it can be run on rails into a double-ended cylinder with hinged doors at each end, Fig. 5. It is in these cylinders that the preservative, most commonly creosote oil, is forced into the wood. Various processes are used, but the one which has proved the most efficient for the treatment of poles is termed the Rueping process, named for its patentee. This process consists in injecting into the wood under heavy pressure a large quantity of creosote. By the pre-injection of air pressure the return of at least 50 per cent of the total injection is accomplished. The advantages of this process are that it secures deep penetration at a minimum cost for preservative and at the same time leaves the wood dry and quite free from the objectionable presence of loose creosote on the outside of the pole.

Each cylinder is capable of holding three large carloads of poles, and each pole is measured carefully so that the cubical contents of each cylinder-load is known accurately. With this information and knowing the number of pounds of preservative to be injected into each cubic foot, the total injection is computed. Recording gages showing volume, temperatures and pressures enable accurate work to be performed. If the poles already are air-seasoned the first step is to fill

the entire cylinder with air under a pressure of from 50 to 125 lb. This air permeates the wood. The cylinder then is filled with creosote oil having a temperature of approximately 200 deg. F.; this is accomplished without releasing the air pressure. The condition then exists of the wood full of air under pressure surrounded by the hot creosote oil. More oil is forced into the cylinder under pressures of from 150 to 300 lb. depending on the type of machinery, until such amount has been injected as will leave 8 lb. per cu. ft. in the wood after release of pressure and the subsequent vacuum.

The preliminary air pressure then forces the surplus or loose oil out of the poles and leaves them dry and clean. While before the use of high air-pressures many of the poles were objectionable to linemen, the modern "empty cell" pole is so different and



Fig. 6. Test borings taken from treated poles to show penetration of treatment; about two-thirds actual size.

so lacking in these disagreeable features that there is no objection made on the part of linemen. The chief engineer of one large power company using 25,000 poles per year recently stated that any objection on the part of their field forces had disappeared entirely.

After treatment the cylinder load or charge is run out of the cylinder on rails and is ready for shipment. Each load as it is removed from the cylinder is tested by an increment borer similar to a diamond core drill. These borings indicate the depth of penetration, Fig. 6, and are a most important check on the results secured.

The desideratum in wood preservation is the complete penetration of all of the sapwood and as much of the heartwood as is possible; material so penetrated cannot be improved upon.

The borings taken after treatment indicate just how nearly these results have been secured and if for any reason they have not been secured the entire load is retreated. Upon completion of treatment a monogrammed dating nail is driven into each pole serving to give a definite check on pole life.

Through tests on the strength of pine poles engineers of one of the largest telephone companies in the United States have found it possible to use much smaller sizes than formerly were considered necessary. Smaller pine poles are equal in strength to the larger poles of other species of wood. One public-utility company in the Chicago district has for three years used nothing but creosoted pine poles, and its requirements for 1926 will total more than 55,000 pine poles.

It probably is impossible for the engineer to estimate accurately in advance the total costs of pole lines which are subject to attacks of decay, insects and storms of any kind. Some of the items to be considered are original costs, framing, peeling or scraping, application of preservative to the butt of the pole, transportation to the site, erection, replacement, return of damaged pole to concentration point for possible salvage, purchase of new pole at probably higher prices, interruption of service, depletion of forests through waste, to say nothing of W.O.M. (worry of mind).

Experience has shown that pine poles properly prepared can be depended on to give a useful life of well above 30 years. The use of 899,401 creosoted pine poles during 1924 as compared with 451,852 in 1923, an increase of 99 per cent in one year, is weighty evidence of the fact that their very great merit is appreciated by those who buy for service.

Acoustic Shock Absorbers Help Telephone Operators*

By L. F. HUNT**, Development Engineer, Southern California Edison Company, Los Angeles

The Southern California Edison Company has a very extensive telephone system of its own. Many of the lines are long and follow transmission lines, in some cases on the same poles. Most of these lines terminate at the main office building where two positions are operated by two operators. These two operators handle all calls from the office to and from various substations and wear head sets continuously during their working hours. Whenever a flash-over occurs on a transmission line, the telephone lines running parallel to and near them pick up a very heavy discharge. If at the same time an operator happens to be using that particular line she will normally receive a very heavy acoustic shock through the receiver. A similar disturbance is caused by switches being out of adjustment, allowing one phase to open before the other; by switching telephone lines where they are closely inductively coupled with the transmission line; by ringing back over same telephone line, or other disturbances.

* Patent applied for.

** All rights reserved by the author.



Fig. 5. Vacuum cylinders, fitted with doors at each end.

Prevalence of acoustic shock from various causes and its undesirable effect upon the telephone operators caused an investigation to be made into the possible design of a simple apparatus to relieve the condition.

Since the acoustic shock is made by the diaphragm of the receiver hitting the pole pieces of the receiver, mechanical means first were tried to stop this action. The result was very unsatisfactory. Then it was decided that the only method which would be satisfactory was some saturating device in series with the receiver of the head set. Since a small saturating transformer would not be sufficient in itself the ordinary 3-element vacuum tube seemed to be the only solution. The vacuum tube has the characteristic curve as shown in Fig. 1; that is, the plate current will not increase over a given grid potential. Two devices were made using the ordinary audio-frequency radio transformer with the ordinary UV-199 detector amplifier tube. These were placed in series with the receiving circuit of the ordinary operator's head sets. Thus it took only two of these outfits for the two operators and to cover all the incoming private telephone lines.

Before the units were placed in service the operators kept the receiver away from their ears in anticipation of an acoustic shock. In spite of the precaution they were more or less seriously affected by an acoustic shock. However, during the past year and a half, since the installation of the units, the operators have suffered no bad effects from acoustic shocks, have full confidence in the device and operate with the receiver clasped tightly against their ears. In one instance an

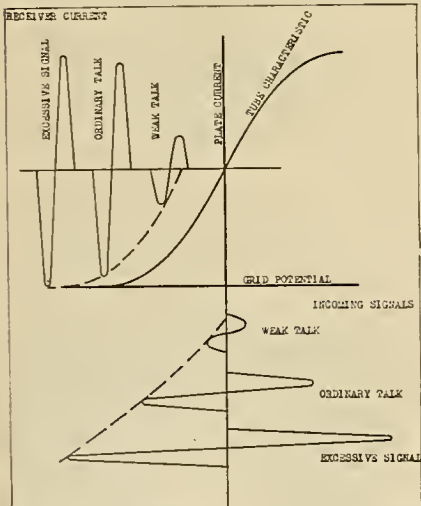


Fig. 1. Characteristic curve of the UV-199 tube used in the Southern California Edison Company's acoustic shock absorber for use on "high-line" phone exchanges. Ordinary talk variation is about from -8 to +8 volts. The equipment saturates at about +9 or -9 volts, thus eliminating signals of excessive values.

operator was instructing a student on one of the positions, the student using the protective device and the operator using an ordinary head set. An acoustic shock came over the line and the student heard only a click, while the operator received a shock from which it took her approximately an hour to recover.

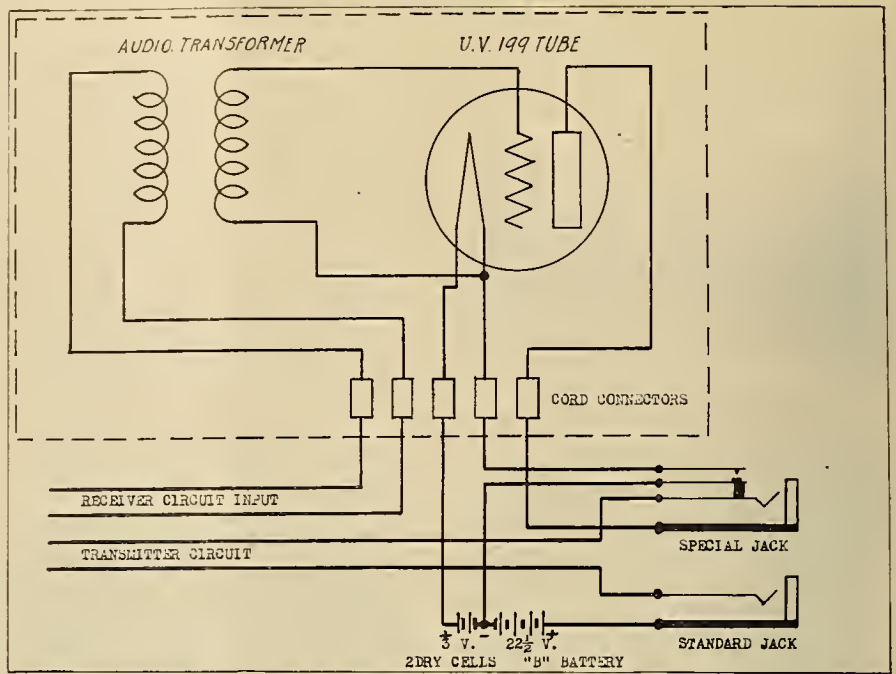


Fig. 2. Complete wiring diagram for acoustic shock absorber.

Fig. 2 is a complete wiring diagram of the unit as it is connected in a permanent manner on one of the positions.

The material used for the complete installation is as follows:

- 1 Dongan audio-frequency amplifying transformer.
- 1 U.V. 199 Radiotron tube.
- 1 Workrite U. V. 199 socket.
- 1 Special jack filament control
- 1 22½-volt B battery.
- 2 No. 6 dry cells.
- 5 No. 9 Western Electric cord connectors.
- Miscellaneous materials, screws, wire, solder, bakelite base for mounting above, etc.

The Dongan transformer gave the best results of the many makes tried. The Workrite socket, having a very good shock-resisting base, proved satisfactory; outside jars and vibrations cause no disturbances. Flexible leads should be used for connection to the socket.

The socket, transformer and cord connectors are mounted on a small bakelite base. The outfit including batteries is placed in the lapboard of switchboards. Thus all connections are very short.

From the above it readily may be seen that ordinary radio apparatus is used throughout. Each tube has its separate battery so as not to complicate the units. The UV-199 tubes work very well on two dry cells direct, eliminating the necessity of a rheostat. It has been found that two dry cells will operate one tube for approximately three months, using them eight hours a day. The small-type B battery generally lasts about one year. The filament of the tube is energized through a special jack which closes contact when the telephone operator's head-set plug is inserted in the jack, thus making the filament control automatic.

The telephone department is installing these units on all positions where there is apt to be any acoustic shock of dangerous character.

Gunite Process Places Tunnel Lining 30 In. Thick

A departure from common methods of tunnel-lining recently was brought to a successful completion on the Melones project of the Oakdale and South San Joaquin Irrigation District. To draw water from the lake to be created by the Melones dam on the Stanislaus River it was necessary to drive a 415-ft. tunnel through the adjacent solid rock.

The lining of this tunnel section was placed entirely by the Gunite process. Of itself this is no startling fact, but when it is considered that the thickness of the lining varied from 18 to 30 in. this method of deposition is of interest. As designed, the tunnel has a section 14 ft. 6 in. in diameter. Overbreak in the rock caused openings considerably in excess of this at many points, but not consistently enough to permit the tunnel section to be enlarged subsequently without still more excavation at several points. This fact accounts for the varying thickness and also for the unusual thickness. No reinforcement was used in the lining.

The total job required about 2,000



Fig. 1. Working up toward the crest of the arch

cu.yd. of concrete and required about 50 8-hr. shifts for placement. Due to the dryness of mix permitted by the Guniting process only light forms were required and it was necessary to leave these forms in place only about 48 hr. If the overbreak had not necessitated such an excessive thickness of lining the lining could have been



Fig. 2. Completed tunnel at entrance end; ellipse approximately 10x30 ft.

placed without any form other than a curved steel sheet right at the apex of the arch, and that only while the aggregate was being placed.

The Guniting process made use of a 1:4½ mix of materials mixed dry and conveyed through hose under air pressure to the depositing nozzle where the water was mixed in just as the materials left the nozzle. The process was extremely flexible. A single mixing station served about 200 ft. of tunnel from one location, through the flexible hoses, necessitating only infrequent movings. Air was supplied from a compressor station located at the tunnel entrance, 600 ft. from the gun.

In the particular job referred to above the tunnel-lining work was carried on by the Cement Gun Construction Company of California, under the general direction of E. H. Halloran, manager.

Safe Primary Fuse Replacement Provided by Bracket

By A. S. GLASGOW, Assistant Superintendent Electric Transmission and Distribution, San Diego Consolidated Gas & Electric Company, San Diego.

Primary transformer cutouts sometimes break down and set crossarms afire. It has been the practice of the San Diego Consolidated Gas & Electric Company to effect emergency repairs in such cases by knocking the defective apparatus off the crossarm, making a solid tap by means of a screw connector. This rough measure would permit service to be maintained until a new cutout could be installed.

Since a defective transformer may provide a direct path from phase-wire to ground, the above-mentioned method of repair presented hazards to the troubleman. In making the temporary connection to bridge the gap left by the bad-order cutout he would be in danger even though the other side of the transformer were open.

To guard against such contingencies a number of special brackets were made up. Details of these holders are shown in Fig. 1; method of application in Fig. 2. The two arms of the device that grip the top of the crossarm are fitted with points which bite into the

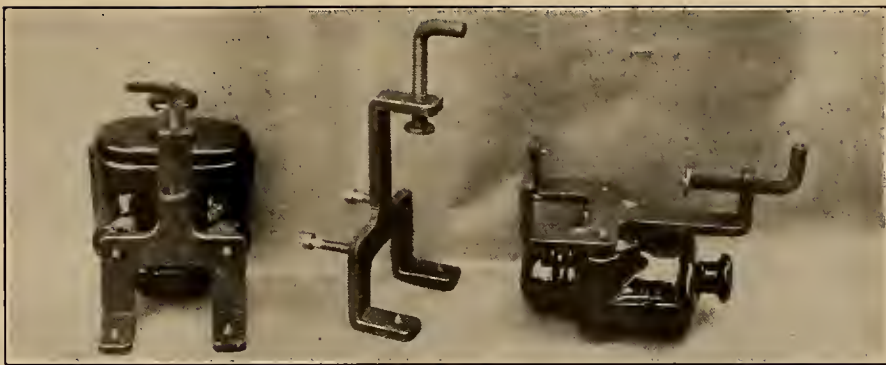


Fig. 1. Special safety bracket; method of mounting primary cutout.

wood. These points are formed by drilling the arms, screwing pointed studs through to the desired depth and then cutting the studs off flush with the outside of the arm. The thumb-screw also is pointed and is fitted with a washer to prevent too deep penetration. No tools are required to mount the bracket.



Fig. 2. Special bracket attached to crossarm.

Each troubleman carries two of these devices in his car. When a defective cutout is found it is removed from the arm in any safe manner that may be necessary and the special holder bracket installed in its place. Later, when permanent repairs are effected, the emergency device is returned to the troubleman.

Numerical Switch Designation Aids Dispatchers

By W. C. FOSTER, Assistant Operating Engineer, Portland Electric Power Company

A system of designation has been worked out for the various lines of the Portland Electric Power Company. This system makes use of numbers for all lines whose voltage is 4.5 kv. or above, including arc circuits. Names are used for lines of less than the above voltage, including railway feeders and the 250-volt d.c. feeders. Since both 33 and 60-cycle lines prevail it is necessary that the number designation completely identify the line in question as well as to give its voltage and frequency. In the cases of the 11, 33 and 57-kv. lines the first two digits in the line number tell the voltage, the

third digit indicates the frequency and the last two the individual line number. For example, line No. 11,631 would be 11-kv., 60-cycle line No. 31; and line No. 33,303 would be 33-kv., 33-cycle line No. 03. This system has been in use for several years and has proved to be entirely satisfactory.

The numbering system has been applied to switches with similar satisfaction. Pole-top switches are numbered consecutively, beginning with the first switch in the line. A metal tag on the pole bears the number of the switch and the number of the line which the switch controls. This helps materially in emergencies when it may be necessary to send someone to operate a certain switch with which he may not be familiar. Stations have been assigned blocks of numbers consisting of not less than three numerals. Even numbers are assigned to oil switches and odd numbers to air switches. All of these numbers are marked on or adjacent to the apparatus to which it applies and also is noted in its proper place on the dispatcher's diagram.

The system of number designation was adopted for several reasons: names were considered to be too lengthy in giving switching orders over the telephone and in making log-book entries; with numbers there is less liability of misunderstanding between dispatcher and operator; with numbers an operator is less liable to open the wrong switch. The general use of three consecutive numbers for line switch, oil switch and bus switch on any line is a great help in checking switches. For instance, if the operator reports switches 1,861, 1,862, 1,863 open on a certain line the dispatcher knows at once that the line switch, oil switch and bus switches are open on that line. A break in number rotation in reporting immediately will give rise to a question.

A 40,000-kva., 25-60 cycle frequency changer is being built by the Westinghouse Electric & Manufacturing Company for the Commonwealth Edison Company of Chicago. This is the largest machine of this character ever to be attempted up to the present time. The machine will be used to tie together the two branches of the company's system. Some of the refinements will include a motor-operated frame-rotating device, direct-connected induction starting motor, and two direct-connected exciters.

IDEAS FOR THE CONTRACTOR

Electrical Work Reported as Two Per Cent of Building Cost

The electric work represents only two per cent of the cost of construction work, according to a survey made by the United States Department of Labor. This is the smallest of any of the items included in the report.

The proportionate divisions, including labor and materials, are as follows:

Foundations and masonry.....	\$ 36.10
Carpentry	29.10
Plumbing	10.00
Heating	8.70
Hardware—metals	7.60
Painting	6.50
Electric, including fixtures.....	2.00
	\$100.00

These figures present an indictment against electrical men. They represent an opportunity to contractors and others in the electrical industry to sell more electrical wiring in order to bring this up to a reasonable figure of at least six per cent, three per cent for wiring and three per cent for fixtures.



Mary Briant, motion picture actress, just after she tacked the Red Seal poster on the first Red Seal home in Los Angeles, which was built for J. M. Close. W. F. Brainerd, California Electrical Bureau, is looking the poster over carefully. A. S. Tyler, electrician who installed the wiring, is standing in the doorway with Miss Briant.

Cross Index for the Electrical Safety Orders—II

Cross-Reference Tables for Use with the Orders Issued by the Industrial Accident Commission of California

A cross-index for the Electrical Safety Orders of the Industrial Accident Commission of California has been prepared by E. Earl Browne, manager of the San Francisco Association of Electrical Contractors and

Dealers. This will be an aid to contractors, inspectors and others in the industry, for under any heading all of the references to that particular subject may be found. The final installment is presented herewith.

Subject	Order	Parts of other orders dealing with the same subject
MOTORS, MOTOR CONTROL EQUIPMENT, AND MOTOR WIRING—711		
Voltage Limitation.....	711- 1(a)	717-4(a).
Terminating Metal Conduit at Motors and Control Equipment.....	711- 2(b)	711-4; 711-5(d).
Wiring Between Resistors and Controllers.....	711- 2(c)	717-1(b); 717-4(d).
Control Circuits.....	711- 2(d)	702-1(a); 711-9(a)1.
Conduit Required.....	711- 4(a)	703-9(a); 711-2(b); (Note).
Minimum Size of Conductors Carrying Current of One Motor.....	711-5(a)	711-6(g).
Demand Factor	711- 5(e)	702-1(r).
Size of Conductors in Secondary Circuits of Slip Ring Motors.....	711- 5(d)	702-1(a); 711-2(b); (Note); 711-5(k); 711-5(j); (Note); 711-6(j).
Size of Conductors to Resistors Used with Direct Current Motors.....	711- 5(e)	711-2(b).
Circuit Breakers or Fuses Protecting Motor Feeders and Branch Circuits.....	711- 5(g)	702-1(p); 711-6(e); 711-6(a).
Branch Circuits for Certain Alternating Current Motors	711- 5(j)	711-5(d)3.
Exception Applying to Certain Two-Speed Varying-Speed Motors.....	711- 5(k)	711-5(d); 711-6(k); 711-15(c).
Cutout Required.....	711- 6(a)	711-6(i); (Note); 711-5(g); 711-6(e).
Mechanical Operating Devices.....	711- 6(d)	711-14(b); 717-2(i).
Fuses in Multiple.....	711- 6(e)	711-5(g); 711-6(a).
Individual Starting Overload Cutouts—When Required.....	711- 6(g)	711-5(a); (Note).
Grouping Motors Under One Set of Fuses.....	711- 6(i)	711-6(a)2; 717-2(e); 711-6(a).
Overload Cutouts—Motors of Short-Time Rating and Motors Used for Duty-Cycle Work	711- 6(j)	711-5(d)3.
Exception Applying to Certain Two-Speed Motors	711- 6(k)	711-6(a)3
Grounding Motors and Control Equipment.....	711- 8	704-4.
Grounding Noncurrent-Carrying Metal Parts	711- 8(a)	703-11(f); 708-1(b); 708-1(i); 702-1(x).
Switches for Disconnection.....	711- 9(a)	711-2(d); 711-9(d); 717-4(g); 711-2(d); 709-3(e); 717-2(e); 717-2(b).
Location of Starting Switches and Starters.....	711- 9(c)	711-12(a)3.
Working Space About Motors and Control Equipment	711-10(a)	710-2(d); 711-12(a)2; 712-2(e); 713-1(c).
Protection from Mechanical Injury and Deteriorating Agencies.....	711-11(b)	713-8.
Steps and Handrails.....	711-11(d)	712-2(d).
General Requirements—Enclosure, Guarding, Isolation.....	711-12(a)	711-9(c).
Remote Control Equipment—Additional Requirements	711-12(c)	709-2(f); 711-8(a); (Except. 2); 711-14(f).
Protection from Mechanical Injury and Deteriorating Agencies.....	711-12(d)	713-8.
Enclosing Arcing or Sparking Parts—Explosives, Highly Inflammable Gases, etc.....	711-13(a)	713-8(d); 713-4(f).
Enclosing Arcing or Sparking Parts—Inflammable or Explosive Dust.....	711-13(b)	713-8(Note).
Mechanical Operating Devices.....	711-14(b)	711-6(d); 717-2(i).
Over-Speed Protection.....	711-14(c)	712-2(b).
Emergency Stop Device.....	711-14(e)	712-2(c); 717-2(i).
Warning Signs at Automatically Controlled Machines	711-14(f)	711-12(c).
Overload Protection—Wound-Rotor and Direct Current Motors.....	711-15(c)	711-5(k).

Subject	Order	Parts of other orders dealing with the same subject
GENERATORS AND ROTARY CONVERTERS—712		
Direct Current Generators.....	712-1(a)	713-4(f).
Speed-Limiting Devices for Motors Driving Generators and Rotary Converters.....	712-2(b)	711-14(c).
Emergency Stopping Devices.....	712-2(c)	711-14(e).
Steps, Handrails and Ladders.....	712-2(d)	711-11(d).
Working Space and Guarding.....	712-2(e)	711-10(a).
MISCELLANEOUS ELECTRICAL INSTALLATIONS—713		
Workspace and Guarding.....	713-1(c)	711-10(a).
Insulating Mats.....	713-1(e)	708-1(i).
Portable Cords.....	713-4(b)	713-8(c); 702-1(x).
Elevation of Switches, Cutouts and Receptacles.....	713-4(d)	717-4(j).
Type of Motors and Generators Required.....	713-4(f)	712-1(a); 711-13(a).
Wires in the Vicinity of Tanks.....	713-5(d)	713-8(b).
Electrical Equipment Operating Under Abnormal Conditions.....	713-8	711-13(b).
Location and Protection of Equipment.....	713-8(a)	711-11(b).
Insulation of Conductors Exposed to Deteriorating Agencies.....	713-8(b)	711-12(d); 713-5(d).
Portables and Pendants in Hazardous Locations.....	713-8(c)	713-4(b).
HEATING DEVICES AND APPLIANCES—714		
Cutouts.....	714-1(b)	702-1(h).
Voltage Limitations.....	714-1(e)	702-1(j).
Transformers.....	714-2(d)	705-2(b)(4).
Guarding Exposed Live Parts.....	714-2(h)	709-2(f).
THEATRES, MOVING PICTURE ESTABLISHMENTS AND MOVING PICTURE STUDIOS—715		
Working Space.....	715-2(b)	710-2(b); 710-2(c); 715-2(e).
SIGNS—716		
General Requirements.....	716-1(a)	703-11(d).
ELECTRIC ELEVATORS AND ELECTRIC HAULAGE EQUIPMENT—717		
Conductors.....	717-1(b)	711-2(c).
Crane Motors.....	717-2(e)	711-6(i); 711-9(a)5.
Controllers and Resistors.....	717-2(i)	711-6(d); 711-14(b).
Limit Switches.....	717-2(j)	711-14(e).
Voltage Limitations.....	717-4(a)	711-1(a); 702-1(g).
Wires Between Motors and Controllers.....	717-4(d)	711-2(c)2.
Flexible Conductors.....	717-4(f)	702-1(x).
Switch for Disconnecting Motor and Control Equipment.....	717-4(g)	See No. 334-o Elev. Orders.
Metal Cases Required for Limit Switches, etc.	717-4(j)	713-4(d).

Strip-Heaters Installed on Fire Apparatus to Warm Manifolds

Strip-heaters have been installed on all fire apparatus, the police patrol and city ambulance in Fresno, Calif. By this means the motors are always warm and will start instantly and will run without backfiring.

The heaters are mounted on the manifolds and are connected to a male convenience outlet on the dashboard or other convenient location, by slow-

burning wire. The female half of the convenience outlet is connected to the connecting extension cord in order that it may be dropped to the floor without shorting. The receptacle is prevented from breaking by means of a rubber disk with a hole in it. With this protection it may be dropped to the floor without damage.

Most of the heaters are 500-watt, 110-volt Westinghouse strip-heaters. Fresno has been one of the most

progressive cities in the matter of electrification of its fire houses. A number of the old houses have been remodeled and made all-electric; all new houses are built with electric air-heaters installed in the offices and rooms, and an electric range is installed in each kitchen.

Questions and Answers on the Code and Safety Orders

Arrangements have been made with Claude W. Mitchell, electrical engineer of the Board of Fire Underwriters of the Pacific, to answer through the columns of the Journal of Electricity such questions on the National Electrical Code as are of general interest.

Similar arrangements have been made with George E. Kimball, electrical engineer of the Industrial Accident Commission of the State of California, to answer questions on the Electrical Safety Orders issued by the Commission.

While it is the object of this department to assist in a better understanding of the Code and the Safety Orders, replies given are not to be considered as official interpretations applying in all instances, as some of the rules permit of varying interpretations under different conditions. The questioner should be guided by the inspection department having jurisdiction.

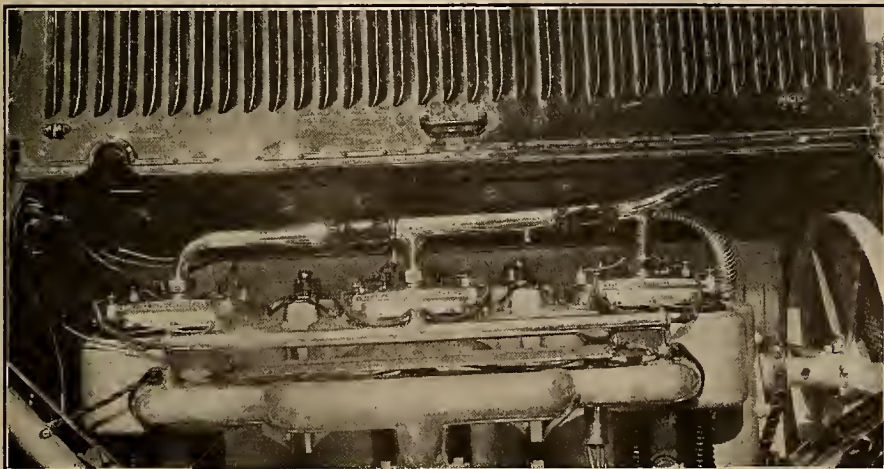
All who are interested are invited to send in their inquiries regarding the National Electrical Code to Claude W. Mitchell, Board of Fire Underwriters of the Pacific, Merchants Exchange Building, San Francisco, Calif., or to the Editor, Journal of Electricity, 883 Mission Street, San Francisco. Questions on the Safety Orders should be sent to George E. Kimball, Industrial Accident Commission, State Building, Civic Center, San Francisco, or to the Editor.

Q. 10. Does it require larger conductors for a 10-hp. 220-volt 3-phase motor which is started by throwing it directly on the line without a starting compensator than it would if a compensator was used?

A. Under ordinary conditions, with a starting compensator to reduce the line voltage, No. 6 and No. 8 wire would be used as shown in Table 711-15 (k). Without the starting compensator larger wire and fuses would be required, [See Order 711-15 (d)]. Without the compensator and a normal run of but a few feet from the distribution switch to the motor No. 4 should be large enough. The setting of the motor running overload protection would remain at 35 amp. regardless of the size of the circuit conductors.

Q. 11. Is low-voltage protection required with the starting switch for a 5-hp. motor connected by a short belt to a shaft driving a group of sewing machines? The belt is housed completely and the shaft is guarded.

A. No. In the revision of the Electrical Safety Orders the requirement for low-voltage protection was modified. The General Safety Orders of the Industrial Accident Commission require that exposed belts, pulleys and shafting be properly enclosed or guarded. When such guarding is provided on sewing machine equipment, there is little danger of an employee being injured through the sudden restarting of the motor after a failure of power. Low-voltage protection usually would be required by Electrical Safety Order 711-14 (a) if the motor was driving more than one shaft with other equipment connected.



Electric strip-heater installed on manifold of fire engine to keep it warm and ready to start at all times.

Electrical Estimating for the Contractor — X

Proper Grouping of Machines and Layout of Plant Important

Considerations when Using Line-Shaft Drive

By J. R. WILSON,* Engineering Department, Los Angeles Electric Works.

Valuable information pertaining to line shafting is given in Tables 7, 8 and 9. On every line-shaft set-up the apparent size of suitable shaft as given in Table 7 always should be checked against the computation obtained from Chart 1. The size obtained from the chart is the size to use for best results.

After the maximum demand has been determined the next step is to determine the proper grouping of the machines. Whether to use a single line shaft with the machines all in one row, or to use several groups of machines, each group driven by a separate group shaft (and all in turn driven from the main shaft) can be determined only by the available floor space, the operating conditions and the customer's preference.

The practice of splitting the load up into several groups and driving each group by a separate motor is ideal, especially if the group loads can be divided about evenly. In that case the motors can all be of the same size, and by having one spare motor on hand loss of time due to burn-outs is reduced to a minimum. This would result in a material reduction in the cost of the line-shaft equipment and also in the erection cost. The approximate saving probably would amount to between 30 per cent and 40 per cent. The four small motors would cost about twice as much as one large motor.

In advising an owner on the selection of motors for line-shaft drive, an effort should be made to induce him to provide a certain "over capacity." It is the general rule that additional machines always are connected to available line shafts. A plant manager may comb the market for all the latest machines adapted to his business and may purchase what is rated as a strictly up-to-the-minute layout of machinery. Inside of a year a new machine designed to revolutionize a certain step in his scheme of operation may appear on the market. If the machine has enough merit he will want to purchase it and add it to his present layout.

It is of course impracticable to foresee and provide for every contingency of this nature that may arise, nor would it be good business to advise a manager to purchase motors of much larger capacity than necessary for his present load, but if the load indicates a 5-hp. motor the investment in a 7½-hp very likely would be justified. So with a 15-hp. to handle a 10-hp. load, or a 20-hp. to handle a 15-hp. load. This especially holds true with the new type of high-resistor motors where starting compensators are not necessary. By a careful selection of line-shaft speeds and arrangement of the line shafts it is sometimes possible to dispense with the purchase of a spare motor by having a small over-capacity on each of the active motors. A layout of this kind is shown in Fig. 2 and the caption explains the set-up.

Due to lack of personal experience

some estimators are prone always to tell a prospective customer, "Individual motor drive is the modern and logical set-up to use in your plant." In the case of special machinery or conditions this may very well be true, but in the majority of plants the manufactured article represents a series of operations which are progressive from the raw material to the finished product. With this fact in mind it may readily be seen that a large extra investment in individual motors and wiring always does not represent real economy.

The fallacy that individual motor drive will fit every manufacturing condition is based upon several wrong conceptions of the troubles that are supposed to be inherent to line-shaft drives. Lack of flexibility of possible operation is one of the chief arguments put forth against line-shaft drive. "If it is desired to perform only one operation or to run only one machine, it is necessary to drive all the line shafts to do so." Very true, but if this condition arises only as an occasional emergency, which could not have been foreseen and provided for, it is not in itself a true argument against line-shaft drive. In a series of manufacturing operations it is necessary so to time the movements of the product from one machine to another that there will be no lost motion.

Table 7

Horse-Power of Shafting

The following tables are compiled from these well-known formulæ:

Formula No. 1: $H. P. = D^3 R + 125$

Formula No. 2: $H. P. = D^3 R + 90$

Formula No. 3: $H. P. = D^3 R + 75$

Formula No. 4: $H. P. = D^3 R + 50$

D = Diameter of Shaft. R = Revolutions Per Minute.

Formula No. 1 is used for extra heavy work on shafts acting as prime movers or main head shafts carrying main driving pulley, sheave or gear, well supported by bearings.

Formula No. 2 is used for regular line shafts carrying pulleys, gears, etc., with bearings every eight feet.

Formula No. 3 is used for line shafts doing medium work, carrying pulleys, gears, etc., of moderate size, with bearings every eight feet.

Formula No. 4 is used for line shafts doing light work, simply transmitting power, with bearings every eight or ten feet.

Diameter of Shaft—Inches	NUMBER OF REVOLUTIONS PER MINUTE														
	1	50	75	100	125	150	175	200	225	250	300	350	400	450	
$1\frac{1}{2}$ Formula 1	.0238	1.19	1.78	2.38	2.97	3.56	4.16	4.76	5.33	5.95	7.14	8.33	9.52	10.91	
$1\frac{1}{2}$ Formula 2	.0330	1.65	2.48	3.30	4.13	4.95	5.78	6.60	7.43	8.25	9.90	11.55	13.20	14.85	
$1\frac{1}{2}$ Formula 3	.0396	1.98	2.97	3.96	4.95	5.94	6.93	7.92	8.91	9.90	11.88	13.86	15.84	17.82	
$1\frac{1}{2}$ Formula 4	.0594	2.97	4.46	5.94	7.43	8.91	10.40	11.88	13.37	14.85	17.82	20.79	23.76	26.73	
$1\frac{3}{4}$ Formula 1	.0384	1.92	2.88	3.84	4.80	5.76	6.72	7.68	8.64	9.60	11.52	13.44	15.36	17.28	
$1\frac{3}{4}$ Formula 2	.0533	2.67	4.00	5.33	6.67	8.00	9.33	10.66	12.00	13.35	15.99	18.69	21.36	24.03	
$1\frac{3}{4}$ Formula 3	.0641	3.20	4.81	6.41	8.01	9.61	11.21	12.81	14.41	16.02	19.22	22.42	25.63	28.83	
$1\frac{3}{4}$ Formula 4	.0961	4.81	7.21	9.61	12.01	14.42	16.82	19.22	21.62	24.03	28.83	33.64	38.44	43.25	
$1\frac{5}{8}$ Formula 1	.0582	2.91	4.36	5.82	7.27	8.73	10.18	11.64	13.09	14.55	17.46	20.36	23.27	26.18	
$1\frac{5}{8}$ Formula 2	.0808	4.04	6.06	8.08	10.10	12.12	14.14	16.16	18.18	20.20	24.24	28.28	32.32	36.36	
$1\frac{5}{8}$ Formula 3	.0970	4.85	7.27	9.70	12.12	14.55	16.97	19.39	21.82	24.24	29.09	33.94	38.79	43.64	
$1\frac{5}{8}$ Formula 4	.1455	7.27	10.91	14.55	18.18	21.82	25.46	29.09	32.73	36.37	43.64	50.91	58.18	65.46	
$2\frac{1}{8}$ Formula 1	.0837	4.19	6.28	8.37	10.47	12.56	14.65	16.75	18.84	20.93	25.12	29.31	33.50	37.68	
$2\frac{1}{8}$ Formula 2	.1163	5.82	8.73	11.63	14.55	17.45	20.36	23.26	26.18	29.10	34.89	40.74	46.56	52.38	
$2\frac{1}{8}$ Formula 3	.1396	6.98	10.47	13.96	17.45	20.93	24.42	27.91	31.40	34.89	41.87	48.85	55.82	62.80	
$2\frac{1}{8}$ Formula 4	.2093	10.47	15.70	20.94	26.17	31.40	36.64	41.87	47.10	52.34	62.80	73.27	83.74	94.21	
$2\frac{3}{8}$ Formula 1	.1159	5.79	8.69	11.59	14.48	17.38	20.27	23.17	26.07	28.96	34.76	40.55	46.34	52.14	
$2\frac{3}{8}$ Formula 2	.1609	8.05	12.08	16.09	20.13	24.14	28.17	32.18	36.12	40.25	48.27	56.35	64.36	72.45	
$2\frac{3}{8}$ Formula 3	.1931	9.65	14.48	19.31	24.14	28.96	33.79	38.62	43.44	48.27	57.93	67.58	77.24	86.89	
$2\frac{3}{8}$ Formula 4	.2896	14.48	21.72	28.96	36.21	43.45	50.69	57.93	65.17	72.41	86.89	101.40	115.90	130.30	
$2\frac{5}{8}$ Formula 1	.1553	7.76	11.65	15.53	19.41	23.29	27.17	31.06	34.94	38.82	46.59	54.35	62.11	69.88	
$2\frac{5}{8}$ Formula 2	.2157	10.79	16.19	21.57	26.98	32.36	37.76	43.14	48.55	53.95	64.71	75.53	86.28	97.11	
$2\frac{5}{8}$ Formula 3	.2588	12.94	19.41	25.88	32.35	38.82	45.29	51.76	58.23	64.70	77.64	90.58	103.50	116.50	
$2\frac{5}{8}$ Formula 4	.3882	19.41	29.12	38.82	48.53	58.23	67.94	77.64	87.35	97.05	116.50	135.90	155.30	174.70	
$3\frac{1}{8}$ Formula 1	.2028	10.14	15.21	20.28	25.35	30.42	35.49	40.56	45.63	50.69	60.33	70.97	81.11	91.25	
$3\frac{1}{8}$ Formula 2	.2816	14.08	21.12	28.16	35.20	42.24	49.28	56.32	63.36	70.40	84.48	98.56	112.60	126.72	
$3\frac{1}{8}$ Formula 3	.3380	16.90	25.35	33.80	42.25	50.69	59.14	67.59	76.04	84.49	101.40	118.30	135.20	152.00	
$3\frac{1}{8}$ Formula 4	.5069	25.35	38.02	50.69	63.37	76.04	88.71	101.40	114.10	126.73	152.10	177.40	202.80	228.10	
$3\frac{3}{8}$ Formula 1	.2591	12.95	19.43	25.91	32.39	38.86	45.34	51.82	58.29	64.77	77.72	90.68	103.63	116.59	
$3\frac{3}{8}$ Formula 2	.3598	17.99	26.99	35.98	44.98	53.97	62.97	71.96	80.96	89.95	107.94	125.93	143.92	161.91	
$3\frac{3}{8}$ Formula 3	.4318	21.59	32.39	43.18	53.98	64.77	75.57	86.36	97.16	107.95	129.50	151.10	172.70	194.30	
$3\frac{3}{8}$ Formula 4	.6477	32.39	48.58	64.77	80.96	97.15	113.30	129.50	145.70	161.90	194.30	226.70	259.10	291.50	
$3\frac{5}{8}$ Formula 1	.3249	16.25	24.37	32.50	40.62	48.74	56.86	64.99	73.11	81.24	97.48	113.73	129.98	146.22	
$3\frac{5}{8}$ Formula 2	.4513	22.57	33.86	45.13	56.43	67.70	78.99	90.26	101.56	112.85	135.39	157.93	180.52	203.13	
$3\frac{5}{8}$ Formula 3	.5416	27.08	40.62	54.16	67.70	81.23	94.77	108.30	121.90	135.40	162.50	189.50	216.60	243.70	
$3\frac{5}{8}$ Formula 4	.8123	40.62	60.93	81.24	101.50	121.90	142.20	162.50	182.80	203.10	243.70	284.30	324.90	365.60	
$4\frac{1}{8}$ Formula 1	.4011	20.06	30.08	40.11	50.14	60.17	70.19	80.22	90.25	100.28	120.34	140.39	160.45	180.50	
$4\frac{1}{8}$ Formula 2	.5571	27.85	41.77	55.71	69.62	83.55	97.48	111.42	125.33	139.25	167.13	195.02	222.84	250.65	
$4\frac{1}{8}$ Formula 3	.6685	33.43	50.13	66.85	83.56	100.30	117.00	133.70	150.40	167.10	200.50	234.00	267.40	300.80	
$4\frac{1}{8}$ Formula 4	1.0028	50.14	75.21	100.30	125.40	150.40	175.50	200.60	225.60	250.70	300.80	351.00	401.10	451.30	
$4\frac{3}{8}$ Formula 1	.4883	24.42	36.63	48.83	61.04	73.25	85.46	97.67	109.88	122.09	146.50	170.92	195.34	219.75	
$4\frac{3}{8}$ Formula 2	.6783	33.91	50.86	67.83	84.77	101.72	118.69	135.66	152.60	169.55	203.49	237.37	271.37	305.19	
$4\frac{3}{8}$ Formula 3	.8139	40.70	61.04	81.39	101.70	122.10	142.40	162.80	183.10	203.50	244.20	284.90	325.60	366.30	
$4\frac{3}{8}$ Formula 4	1.2208	61.04	91.56	122.10	152.60	183.10	213.60	244.20	274.70	305.20	366.20	427.30	488.30	549.40	
$4\frac{5}{8}$ Formula 1	.6990	34.95	52.43	69.90	87.38	104.85	122.33	139.81	157.28	174.76	209.70	244.66	279.61	314.56	
$4\frac{5}{8}$ Formula 2	.9709	48.54	72.81	97.09	121.35	145.62	169.90	194.18	218.44	242.70	291.27	339.78	388.32	436.86	
$4\frac{5}{8}$ Formula 3	1.1650	58.25	87.38	116.50	145.60	174.80	203.90	233.00	262.01	291.30	349.50	407.80	466.00	524.30	
$4\frac{5}{8}$ Formula 4	1.7476	87.38	131.10	174.80	218.50	262.10	305.80	349.50	393.20	436.90	524.30	611.70	699.00	786.40	
$5\frac{1}{8}$ Formula 1	.9629	48.15	72.22	96.29	120.37	144.44	168.51	192.59	216.66	240.73	288.88	337.03	385.17	433.32	
$5\frac{1}{8}$ Formula 2	1.3372	66.86	100.29	133.72	167.15	200.58	234.01	267.44	300.87	334.30	401.16	468.02	534.88	601.74	
$5\frac{1}{8}$ Formula 3	1.6048	80.24	120.40	160.50	200.60	240.70	280.80	321.00	361.00	401.20	481.40	561.70	641.90	722.16	
$5\frac{1}{8}$ Formula 4	2.4073	120.40	180.50	240.70	300.90	361.10	421.30	481.50	541.60	601.80	722.20	842.60	962.90	1083.6	
$5\frac{3}{8}$ Formula 1	1.3310	66.55	99.83	133.10	166.38	199.65	232.93	266.20	299.48	332.75	399.30	465.85	532.40	598.95	
$5\frac{3}{8}$ Formula 2	1.8483	92.42	138.63	184.80	231.05	277.22	323.43	369.60	415.85	462.10	554.40	646.94	739.20	831.78	
$5\frac{3}{8}$ Formula 3	2.2183	110.90	166.40	221.80	277.30	332.70	388.20	443.70	499.10	554.60	665.50	776.40	887.20	998.10	
$5\frac{3}{8}$ Formula 4	3.3275	166.40	249.60	332.80	415.90	499.10	582.30	665.50	748.70	831.90	998.20	1165.0	1331.2	1497.6	
6 Formula 1	1.7280	86.40	129.60	172.80	216.00	259.20	302.40	345.60	388.80	432.00	518.40	604.80	691.20	777.60	
6 Formula 2	2.4000	120.00	180.00	240.00	300.00	360.00	420.00	480.00	540.00	600.00	720.00	840.00	960.00	1080.00	
6 Formula 3	2.8800	144.00	216.00	288.00	360.00	432.00	504.00	576.00	648.00	720.00	864.00	1008.00	1152.00	1296.00	
6 Formula 4	4.3200	216.00	324.00	432.00	540.00	648.00	756.00	864.00	972.00	1080.00	1296.00	1512.00	1728.00	1944.00	

To find H.-P. at speeds not given in table multiply the horse-power at one revolution per minute by the desired speed.

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To find H.-P. at speeds not given in table multiply the horse-power at one revolution per minute by the desired speed.</

In making a plant layout too little thought sometimes is given to the nature of the product and the operations necessary to produce the finished article. Where a certain operation for special reasons must be performed apart from the regular series, an in-

TABLE NO. 8.

Comparative Weights of Finished Steel Shafting.

Diam. in.	Wt. Per ft.	Diam. in.	Wt. Per ft.
15/16	2.35	2 15/16	23.06
1	2.68	3 3/16	27.16
1 3/16	3.77	3 7/16	31.58
1 7/16	5.52	3 11/16	36.40
1 11/16	7.61	3 15/16	41.40
1 15/16	10.03	4 3/16	46.83
2	10.69	4 7/16	52.60
2 3/16	12.80	4 11/16	58.67
2 7/16	15.89	4 15/16	65.50
2 11/16	19.31	5 3/16	71.86

dividual motor for that machine may be the only logical answer. Where a plant makes a number of different articles on which the market demand depends upon seasonal requirements, individual motor drive or a series of group drives may prove to be the correct layout.

A plant manager in seeking products to add to his regular line must give a great deal of thought not only to the investment required in new machinery but also to the way the contemplated product will fit into his present plant operations. An apparently large "paper profit" may prove to be a loss if the new product should turn out to be a misfit. On the other hand, a new product taken on at a very small margin of profit may show a double gain if it serves as a "stop gap" for a previous loss.

These statements serve to stress the fact that a great many factors must be considered before advising a customer as to the proper driving equipment for his plant. Each plant is a problem in itself and should be given a great deal of thought in order that an economically efficient layout may be given for the money expended.

After the plant layout has been decided upon the next step is to determine the speed at which the shaft or shafts will run. Very seldom it will be possible to select a line-shaft speed that will fit every machine so that all may be connected direct to the line shaft. It will be necessary to select a speed that will accommodate the majority of machines with use of standard pulleys.

The present-day tendency toward operating machines at maximum capacity, thereby lowering production cost, has raised the recognized standard of line-shaft speeds above former ratings. The speed of a line shaft determines the hp. transmitted and the highest practicable speed for the particular installation will be the one to use. Use of ball or roller-bearing hangers will permit the use of high speeds on line shafts. The present-day standards for machine-shop main drives is 250 to 350 r.p.m. On wood-working machinery a higher speed is much more desirable and a speed between 400 and 600 r.p.m. should be used. With high-speed line shafts it is possible to use lower belt tension, smaller pulleys and narrower belts. This will reduce the installation cost and will permit higher belt speed.

The next step is the proper location of the motor or motors. In Fig. 2 the motors are shown as being so located as to drive to the center of the line shafts. While this location may appear ideal it is not always the most desirable set-up to use. The location of the driving motor should be determined by the previously mentioned maximum demand and the location and type of the machines creating this demand. A machine demanding considerable hp. should be thrown, if possible, on the line shaft in a slow and gradual manner. A heavy machine which is thrown abruptly onto the line shaft has a tendency to create

distortion in the shaft due to "shock load."

This distortion places an added strain (above normal) upon the hangers and also upon the motor. So we see that just dividing the hp. demand by 2 and placing the motor at the center of the shaft will not do in all cases. In the case of large punch presses, cut-off shears, and rolls, even if provided with heavy fly-wheels, the demand on the line shaft at the instant of doing greatest work must be taken into account. Referring to Fig. 2 the machinery set-up might be such as to indicate the location of each motor at an entirely different point.

Table 9

Standard Sizes of Key Seats						
FOR PULLEYS, GEARS, SHEAVES, SPROCKETS, CLUTCHES, ETC.						
STANDARD TAPER KEYS $\frac{1}{8}$ -INCH PER FOOT						
Diameter of Shaft		Size of Key Inches	Key seat in Hub		Key seat in Shaft	
			Width Inches	Depth Inches	Width Inches	Depth Inches
$\frac{3}{4}$	to	$1\frac{1}{4}$	inches.....	$1\frac{1}{4}$	$\frac{3}{16}$	$\frac{1}{16}$
$1\frac{5}{16}$	to	$1\frac{3}{4}$	inches.....	$1\frac{3}{4}$	$\frac{3}{8}$	$\frac{3}{32}$
$1\frac{11}{16}$	to	$2\frac{1}{4}$	inches.....	$1\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{8}$
$2\frac{5}{16}$	to	$2\frac{3}{4}$	inches.....	$1\frac{5}{8}$	$\frac{5}{16}$	$\frac{5}{32}$
$2\frac{13}{16}$	to	$3\frac{1}{4}$	inches.....	$1\frac{3}{4}$	$\frac{3}{8}$	$\frac{3}{16}$
$3\frac{5}{16}$	to	$3\frac{3}{4}$	inches.....	2	$\frac{7}{16}$	$\frac{7}{32}$
$3\frac{13}{16}$	to	$4\frac{1}{4}$	inches.....	$1\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{4}$
$4\frac{5}{16}$	to	$4\frac{3}{4}$	inches.....	$1\frac{1}{8}$	$\frac{9}{16}$	$\frac{9}{32}$
$4\frac{13}{16}$	to	$5\frac{1}{4}$	inches.....	$1\frac{1}{4}$	$\frac{5}{8}$	$\frac{5}{16}$
$5\frac{5}{16}$	to	$5\frac{3}{4}$	inches.....	$1\frac{3}{8}$	$\frac{11}{16}$	$\frac{11}{32}$
$5\frac{13}{16}$	to	$6\frac{1}{4}$	inches.....	$1\frac{1}{2}$	$\frac{3}{4}$	$\frac{3}{8}$
$6\frac{5}{16}$	to	$6\frac{3}{4}$	inches.....	$1\frac{5}{8}$	$\frac{13}{16}$	$\frac{13}{32}$
$6\frac{7}{8}$	to	$7\frac{1}{4}$	inches.....	$1\frac{3}{4}$	$\frac{7}{8}$	$\frac{7}{16}$
$7\frac{5}{16}$	to	$8\frac{1}{4}$	inches.....	2	1	$\frac{1}{2}$
$8\frac{5}{16}$	to	$9\frac{1}{4}$	inches.....	$2\frac{1}{4}$	1	$\frac{1}{2}$
$9\frac{5}{16}$	to	$10\frac{1}{4}$	inches.....	$2\frac{1}{2}$	1	$\frac{1}{2}$
$10\frac{5}{16}$	to	$11\frac{1}{4}$	inches.....	$2\frac{3}{4}$	1	$\frac{1}{2}$

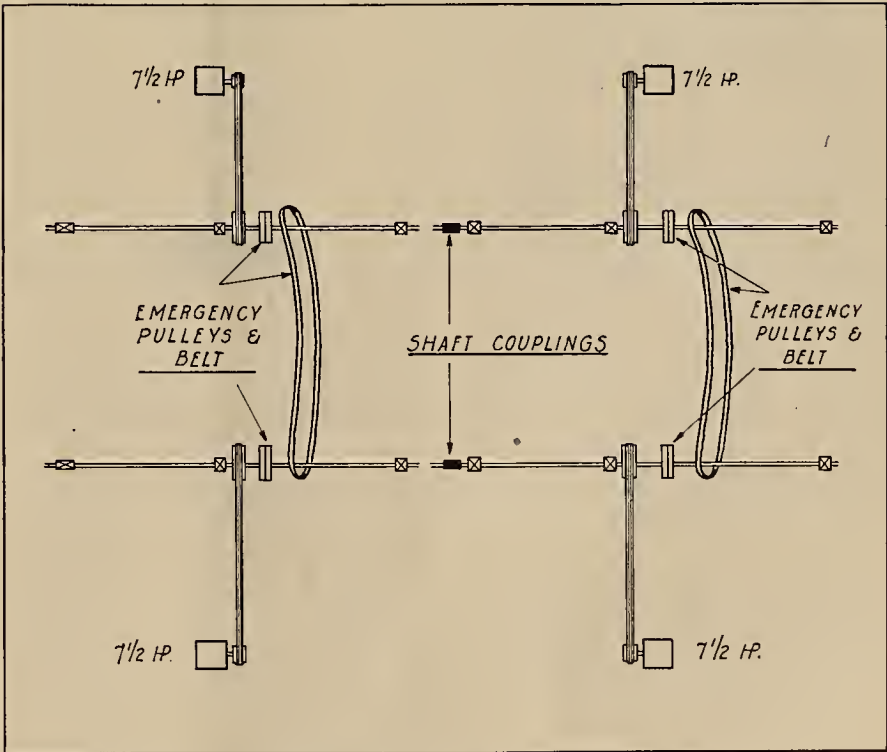


Fig. 2.—Layout of line shafting provided with emergency pulleys and belts. Normal load on each shaft of 5 hp.; the line shaft speeds are all alike. In case of a breakdown one motor carries the two shafts. Such an arrangement gives a maximum of protection and provides for a minimum loss of production. By aid of shaft couplings and emergency belts any two departments may be operated by any motor.

BETTER MERCHANDISING

Don't Overlook the Groom

In June-Bride Sales Activity the Groom Is Almost as Important
as the Bride—Start Him Right

In all this talk about June brides there has been very little said about that necessary accompaniment to every wedding, the June bridegroom. Of course, he does not receive many of the wedding presents, as a rule, but does he not furnish the home and is his happiness not tied up with the domestic success and content of his bride? There is a distinct message to him in the electrical story—why not tell it to him?

The Electrical Service League of British Columbia does not hesitate in answering this question. Already it has included the bridegroom in its program of reaching the public. No sooner has the announcement of the engagement appeared in the paper than the happy gentleman receives this heart-to-heart talk from the secretary of the league:

The Electrical Service League of British Columbia extends to you sincerest congratulations on your approaching wedding and, being mostly benedicts themselves, are presumptuous enough to offer a few suggestions which they have found ensure continuous smooth running of the new home.

1. Provide labor-saving appliances and eliminate manual labor as much as possible.
2. Make cooking pleasant and easy by good lighting and even temperature in the kitchen.
3. Provide electric outlets for portable and standard lamps to permit the good lady to exercise her artistic taste in furnishing.
4. Provide outlets in the bedrooms and boudoir for reading lamp, curling iron, hair dryer, etc.
5. Provide outlets in hall for vacuum cleaner.

Remember that the latter portion of the day is expected to be given to social duties, and it adds wonderfully to the happiness if all the household affairs can be attended to in the morning without worry and over-exertion. Have everything done electrically. It is clean, it is a great time and worry-saver, and it is not expensive.

If you are renting a home, be sure it has provision for the above modern conveniences, and if you are buying or building a home the enclosed pamphlet shows plainly the conveniences a modern home should have.

Again wishing you every happiness,

Yours faithfully,

The bride, in the meantime, has not been overlooked. It is to be supposed that her wishes will be consulted in determining the proper wiring and household equipment to be installed in the new home. She therefore receives the following communication, also from the Electrical Service League:

The Electrical Service League of B.C. extends to you its sincerest good wishes for a long and happy future, and in doing so takes also the liberty of making a few suggestions on modern home equipment which will materially assist towards that end:

This Is A Message to the Women

Knowing that the kitchen is the workshop of every home and—like all workshops—it should have the most modern equipment available. We have arranged a special display of a fully equipped modern (electrical) kitchen at our store.

Keeping in mind as we arranged this display that the average housewife in preparing the meals for the family make many unnecessary steps, thus wasting energy and time that could otherwise be used for rest or recreation.

With the spring and summer seasons approaching, you will value the many extra hours that a modern (electrical) kitchen will give you for motoring or other out-of-door pleasures, to say nothing of the relief from excessive heat.

The modern (electrical) kitchen display opens today. It is FREE to all and places you under no obligation, so come in and see for yourself just what a great help an electrically equipped kitchen can be to every housewife.



BOISE, IDAHO, 2—Stores—2—400, 1000 N. 4.

Advertising pays Roy Walker, of Boise, Idaho, for it helps him to put his store to the front and attract business in the "best sold" district in the country. This advertisement brought people to his model electric kitchen in numbers.

1. Have everything possible electric. It is clean—a great labor- and worry-saver, and is inexpensive.
2. Make sure your new home, whether rented, purchased or built, is equipped with convenience outlets for use of electrical appliances.

If you observe those two cardinal principles at the beginning, housework rapidly becomes a simple matter of routine and allows all the time necessary for social functions and social duties.

Electricity is the modern electric servant. It works quickly and efficiently, requires no training, and is always there when wanted.

The enclosed pamphlet shows very plainly and simply the wiring and outlets requisite for lighting and use of household appliances in a home today.

Again wishing you every happiness, we are,

Yours very truly,

The young couple thus are approached at a propitious moment. If they are counting on building a home—and many of them are—the message of adequate wiring and outlets finds an immediate response. If they are merely renting, their attention is directed at least, toward the selection of an electrically equipped apartment. In any case, the way is prepared for the later sale of washing machine, electric range, vacuum cleaner and other household aids which make for domestic happiness and comfort. What is more, the idea of an electrical home is presented to them at a time when a home seems a very precious and radiant thing. Unconsciously it becomes an ideal which, if it cannot be realized at the moment, is one of the things to be attained later on.

The fact that this letter is, in fact, taken seriously is shown by the responses which have been received, not only from brides, but from the grooms as well.

Model Kitchen Attracts Throngs to Boise Electric Store

A model electric kitchen, built in one of the show rooms in the store, was one of the novel means used by the Walker Electric Company of Boise, Idaho, to interest housewives in up-to-date electrical equipment for the workshop of the home. During the first week this display was arranged, over 1,000 people viewed the electric kitchen, and several thousand more housewives inspected this modern equipment during the remainder of the exhibit.

Advertising featuring this display consisted of a direct-by-mail invitation to the women of Boise, followed by a series of four letters mailed at regular intervals. In addition, a quarter-page advertisement in the leading newspapers was run every other day for a period of sixty days. By following a similar newspaper campaign during the month of December last year this store increased its December business nearly \$4,000 over the same month of the previous year.

Mr. Roy Walker, manager of the Walker Electric Company, is one of the leading merchandisers of the state of Idaho. He is a firm believer in advertising, and because of the quantity and quality of his advertisements, together with proper merchandising methods, he is able to sell a large amount of electrical merchandise in a

territory where a central station sells more merchandise per residential customer than any other in the United States.

Mr. Walker recently has opened up another store in Nampa, Idaho.

Manufacturers' Representative Speaks on Range Sales

Meeting as the guests of Listenwaller & Gough, Inc., at the Elite, Los Angeles, on the evening of March 12 more than three hundred electrical dealers, contractors and central-station representatives enjoyed a splendid dinner and excellent talks on the subject of the electric range and its rapidly growing universality.

This meeting was the culmination of a series of six which the company has held in the interests of better merchandising policies and methods for its customers.

Harry Lippert, representing the A. J. Lindemann & Hoverson Company, manufacturers of the "L & H Electric" ranges, discussed the sales policy adopted by the Pacific Gas and Electric Company and the Great Western Power Company in central and northern California, where, with the co-operation and active help of those power companies, the electrical dealers and leading merchants in the section were encouraged to promote actively the sale of electric ranges.

In touching upon the subject of the sale of electric ranges to women, Mr. Lippert pointed out that the design of the modern range has been made so simple and practical that an immediate appeal is made. "Selling electric ranges to the fairer sex," went on Mr. Lippert, "has outgrown the technical, slide-rule method of selling, and in outfitting a woman's modern kitchen it is only necessary to show her an attractively designed range which will harmonize with her white or French-gray kitchen, and one which easily is kept spic and span."

Elbert Kramer, manager of the electric range and heating appliance department of Listenwaller & Gough, in a very interesting discussion pointed out that electric ranges are no longer in the category of specialty salesmanship but has taken upon itself all the dignity of real merchandising and has opened up possibilities of profit-making which would have been unbelievable under the old regime. Mr. Kramer took occasion to thank the district managers of the Southern California Edison Company and their co-workers for their splendid co-operation which had made possible the success of this series of meetings.

Electragists Report Kilowatt Increases Due to Appliance Sales.—The February report of the California Electragists, Southern Division, on kilowatts represented by the appliances sold by them during the month shows that 205 kw. of load was added to the power-company lines through the merchandising of the Electragists for that month. Of this 205 kw. the toasters for which the combined campaign was staged brought 89 kw. A total of 160 toasters was reported sold in the unified campaign.



Just because the central station in his territory sells more merchandise per residential consumer than anywhere in the United States, is Roy Walker of Boise, Idaho, downhearted? Not at all. With this excellent model electrical kitchen he attracts crowds to his store and sells them still more appliances.

California Best Market for Washing Machines

Manufacturer of Washers on Visit Compliments State but Says Northwest Lags in Washer Sales Efforts

California and the western states offer the best market in the United States to the manufacturer of washing machines, according to Harry L. Barker, president and general manager of The Meadows Manufacturing Company, of Bloomington, Ill., who was a recent San Francisco visitor.

"I have been out here more than a score of times," said Mr. Barker, "and each trip convinces me more thoroughly of the tremendous market advantages you have over the East and Middle West.

"True, you have a very few large merchants in the washing machine business and they enjoy what to some seems tremendous volume. However, I predict for them a very greatly increased business, notwithstanding the inevitable entry of large competitors into the field.

"The washing-machine business has had its share of unscrupulous merchants, as have other lines, and the generous profits have attracted some whose practices and policies have done the industry no good. However, the retailing of electric domestic washers has come to be recognized as so staple, permanent, sound and profitable a business, that it has attracted capital investments equal to that employed in the retailing of motor cars. Two or three of your Pacific Coast retailers have investments approaching the million mark. When one considers that probably no single appliance in the home is so universally necessary, or effects so great a saving of time, physical labor and money, it is not strange that the marketing of washers should be very profitable when done

with ample capital and experienced executive guidance.

"Nowhere in this country are new homes being established at the rate you are growing out here. Nowhere is there the same preponderance of individual homes, as contrasted to the flat and apartment of the East. In these two factors alone you have a big advantage.

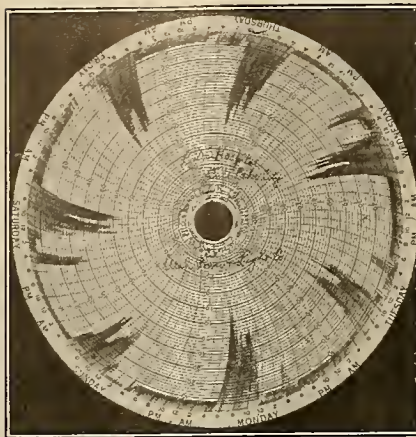
"Your population increases are amazing to anyone unfamiliar with the delights of living here. It is my determination to make California my home in the not too distant future. It has surprised me that the large washing-machine marketing organizations of California have not been duplicated in the Northwest where I am confident equal opportunities exist. That's a great country up there. They have the money, the homes, the up-to-date spirit—everything to attract a large washer organization such as you have in California.

"The difference is that the washing-machine business has been merchandised in California and as good a job has been done as any place in the United States, but the same cannot be said of the Northwest. In my opinion the Northwest has done a rather poor job on washing machines.

"The failure of the central stations on the Coast to recognize the value to them in washer merchandising is also puzzling to me. The fallacy that because the washer is in itself a very small current-consumer it possesses little revenue potentiality has been exploded in the East and as far West as Utah. We have figures, drawn very accurately from the rec-

ords of power companies, showing average increases in current consumption of as high as 50 per cent in groups of homes taken at random, for corresponding periods before and after the sale of electric washers. Investigations made to determine the reason for this increase in the face of the low rating of the motors reveal the fact that the advent of the washer revived or inaugurated the use of other electric appliances. Primarily, of course, the ironer follows the washer. This increased load is an off-peak load for the power company and the washer is a good-will builder second to no other appliance."

Mr. Barker, in discussing future tendencies in the business, expressed the belief that there would be combinations of manufacturers and concentration on fewer types, thus effect-



Demand meter chart showing load distribution as practiced in the Latter Day Saints' Hospital.

ing economies which could be reflected in reduced prices to consumers.

That such a situation as is sometimes referred to as "the saturation point" presented any problem at all to the washing-machine industry was dismissed with a wave of the hand by Mr. Barker, who, as past president of The American Washing Machine Manufacturers' Association, has a keen insight into figures. "Increased demand created by population increase and discarding of old machines far outstrips production and probably will continue to do so indefinitely," said Mr. Barker.

Electric Ranges Prove Efficient in Hospital Installation

Cleanliness, efficiency and economy are outstanding features in the successful operation of a hospital kitchen. The new Edison heavy-duty equipment which was installed recently in the Latter Day Saints' Hospital in Salt Lake City, Utah, is accomplishing remarkable results along this line. This institution now is using two hotel-type ranges, one baking and roasting oven, one 120-loaf bake oven, and a sixteen-slice toaster.

During the month of February of this year the hospital was crowded to capacity, serving 36,000 meals, with a connected load of 67½ kw. and a demand of 35.4 kw. The average cost per meal amounted to .00334 cent, or 131 watts per patient. By placing the demand meter in plain sight of the chef, these results are being obtained. Off-peak hours are used to take care of the pastry baking, fat rendering, and maintaining temperature for the next morning's run, thereby reducing the peak by this operation about 30 per cent. The accompanying chart presents an interesting picture of the results that are being accomplished.

Vancouver Claims Lowest Lighting Rates on Pacific Coast

Vancouver, B. C., claims to have the lowest domestic lighting rates on the Pacific Coast as the result of a reduction made on Jan. 1, 1926, by the British Columbia Electric Railway Company. The new rates are 4½ cents a kw.-hr. for the first three kw.-hr. per 100 sq. ft. of floor area and 2 cents for all current in addition. The former rate was 5 cents on the first step and 2 cents on the second. Corresponding reductions were made in suburban municipalities where the rate is now 5½ cents on the first step and 2 cents on the second. The former rate was 6 cents and 3 cents.

These rates were announced voluntarily, there being no public utility commission in the province of British Columbia.

In the city of Vancouver there have been five successive rate reductions since 1917. At that time the rate was 8.8 cents net plus a meter charge of 15 cents. Rates were dropped to 8 cents net, to 6 cents, to 5 cents and on Jan. 1 the floor-area basis was adopted providing for current at 2 cents after 3 kw.-hr. per 100 sq. ft. were used.

In one of the outlying municipalities now participating in the reduction the cost of current has been cut in two in two years.



Light Up/ Your Home deserves Better Lighting

LIGHT is now so cheap, that every home in Greater Vancouver should enjoy an abundance of warm, soft light.

Check over your lights today and see if your rooms are adequately lighted. Here is the standard used in the 1924 Home Lighting Contest:

	Total Watts
Living room	250 - 500 watts
Dining room (table)	150 - 200 "
Dining room (walls)	50 - 200 "
Kitchen	150 - 250 "
Bedroom	175 - 300 "
Porch	50 - 100 "
Bathroom	10 - 175 "
Basement	200 - 300 "



Dining Room
Fixture

Shade or diffuse every
light.

Let no "raw" light
strike the eye.

Remember that if you have a house of 1,000 square feet, you have to use only 30 kilowatt hours, costing \$1.35 in Vancouver city and \$1.65 in suburbs, before you get current at TWO CENTS A KILOWATT HOUR. Much of the light used on the above standard will be at the two-cent rate.

BRITISH COLUMBIA ELECTRIC RAILWAY CO.



Who would not use more light following so persuasive an invitation? The British Columbia Electric Railway Company attractively advertises its new low rates in order that it may gain greater kilowatt-hour consumption.

These general reductions, together with the adoption of the floor-area basis, are having the effect of increasing the average consumption. During the last few years this average has been going up approximately 10 per cent per annum, and efforts are being made to speed up this increase by advertising and other means.

The domestic-lighting reductions made by the company came on the heels of two other rate reductions, one for commercial lighting and the other for small power. These reductions likewise were made voluntarily.

Postcards Prepare Way for Utah Company Salesmen

Postcards have a tradition. It is a tradition of reminding, for almost invariably a postcard is used to remind someone of one's self or of something. That it should be used to remind prospective buyers of the advantages to be derived from electric refrigeration is a modern application of the tradition. The Utah

Power & Light Company in its refrigeration sales work this year has used this method effectively, according to word received from R. M. Bleak, superintendent of lighting and appliance sales of that company.

A series of sixteen postcards has been prepared by the company. One is sent twice a week to each prospect for electric refrigeration. The cards are mailed so as to reach the prospects on Tuesdays and Fridays of each week. On each card is concentrated in a terse statement one salient feature of electric refrigeration.

Among the points given individual emphasis in this way are: Saving of steps due to having refrigerator in the kitchen instead of on the porch; food preservation in relation to diet; a check to sickness in wholesome food; bacteria control; the housewife being subjected to exposure in going from warm kitchen to cold back porch avoided—a winter appeal; saving in foodstuffs; economies in buying; delicious drinks and appetizing desserts

made; ice cubes at will; danger of food spoilage in winter as well as in summer; men should take interest in home equipment available; women take pride in ownership; winter use of refrigerator; economy both in food and operation cost; children need best in food, kept perfectly; beauty of electric refrigerator; and easy term payments available.

Here is an idea that may be used to advantage also in the merchandising of other electrical appliances.

"Mr. Puget Power" Trade Character for Utility Company.—A series of advertisements, in which "Mr. Puget Power," a trade character, is being utilized to convey the public utility's message to the public, has been started by the Puget Sound Power & Light Company, Seattle. The little trade character is depicted as a small, active, electric brownie, rushing from waterfalls to factory or home over electric wires. Messages printed under his auspices are typewritten, and quite personal in style, written in the first person.



THROUGH the courtesy of the manufacturers of electric appliances, the Bureau of Power and Light in Los Angeles was enabled to provide an exceedingly fine and up-to-date electrical appliance display in its splendid new show rooms recently opened in the basement of the bureau's building. L. E. Moselle is in charge of the electrical appliance display. A. W. Elliott is his assistant. (2) One feature of the exhibit is that it is purely for display purposes. No appliances are sold there, the idea being that customers may come to examine and have demonstrated to them any make of appliance. (1) Another feature of the exhibit is a complete little auditorium with seats for seventy people. (3) The stage is a model kitchen from which cooking demonstrations may be given.



NEWS OF THE INDUSTRY

Agricultural Engineers to Meet at Lake Tahoe June 23-26

Electricity in agriculture, reclamation, farm structures, farm power and machinery, and agricultural engineering research and extension will be the main subjects featured at the annual convention of the American Society of Agricultural Engineers to be held at Tahoe Tavern, Lake Tahoe, Calif., June 23-26.

The meeting will be followed by inspection trips beginning June 28 and extending through four days. While there will be opportunity on these inspection trips for observing many lines of agricultural engineering practice as carried on under California conditions, they will feature chiefly hydroelectric development and its utilization on the farm, irrigation, reclamation and drainage. Included in these trips will be an inspection of the hydroelectric and irrigation systems of the Pacific Gas and Electric Company in Placer County, including Lake Spalding, Drum power house, and the foothill orchard areas about Auburn and neighboring towns, and a drive by automobile through the Modesto and Turlock Irrigation Districts, where particular attention will be paid to irrigation, drainage by pumping, and farm electrification.

Arrangements for the meeting are in the hands of the Pacific Coast Section of the American Society of Agricultural Engineers.

All sessions of the convention at Lake Tahoe will be open to those interested regardless of membership in the society. Those desiring or planning to attend should communicate with Prof. L. J. Fletcher, secretary of the Pacific Coast Section, University Farm, Davis. Headquarters of the convention at Tahoe will be at Tahoe Tavern where all sessions will be held.

First-Aid Contest to Be Staged by Pacific Company

An innovation in the safety work conducted by the Pacific Power & Light Company, Portland, is to be instituted at Pasco, Wash., May 1, 1926, in the form of a contest in first-aid administration in which will compete eight 5-man teams representing different districts or groups of districts of the company. Problems based on the "Manual of First Aid for Miners," issued by the United States Bureau of Mines, will be offered for solution by the competing teams, the winner being given two trophies, one presented by the Sanderson Safety Supply Company, Seattle, for this year's contest, and one by the Pacific Power & Light Company to be competed for annually. Judges are to be chosen from the fire departments of the cities of Wenatchee,

Yakima and Walla Walla, and will be men versed in first-aid practice.

Competing teams are to be chosen locally by the districts from candidates showing the most aptitude in the first-aid studies which have been in progress among the personnel for some time. Instruction in first-aid practice has been a part of the accident-prevention program of G. I. Drennan, field superintendent, and in this phase of the work he has been assisted by H. H. Sanderson and Mr. Schoning of the Sanderson Safety Supply Company. These three men are arranging the details of the Pasco contest, which will be held on the lawn of the company's substation in that city on the above date.

Much interest both inside and outside of the company has been manifested in the coming event, and the company has invited to be present all those desiring to see the work. After the contest, which is scheduled for the morning, a picnic lunch will be served on the grounds for the contestants, spectators and guests.

Contracts Let for Equipment for Melones Power Project

Hydraulic and electrical equipment for the Melones power project of the Oakdale and South San Joaquin Irrigation District in California will be furnished by the S. Morgan Smith Company and the Westinghouse Electric & Manufacturing Company, respectively, which have been awarded the contracts.

The hydraulic equipment includes two turbines rated at 18,500 hp. each, with an operating head of from 220 ft. maximum to 120 ft. minimum. The electrical equipment consists of two 13,500-kva., 6.6-kv. generators and four 9,000-kva. transformers rated at 6.6/110 kv. The Westinghouse company also will supply two 110-kv. oil circuit breakers and other miscellaneous electrical equipment.

For the present there will be one transmission line operating at 110 kv. from the Melones power house to Manteca where it will connect with the Pacific Gas and Electric Company system. Provision will be made for a second line to be erected when conditions warrant.

Paper Company to Begin Construction of Power Project.—The Washington Pulp & Paper Corporation, Port Angeles, Wash., announced that it will develop a hydroelectric power plant at Glines Canyon and will double the output of the company's newsprint mill in Port Angeles. It is planned to begin construction on the proposed power dam early in April, with 200 men employed. The power plant will develop 10,000 hp. The paper plant will add 150 employees to its payroll.

Puget Sound Company Publishes Poultry Booklet

A recent constructive move in operating its agricultural extension service under the direction of J. C. Scott (Journal of Electricity, Feb. 1, 1926, p. 113), is found in the publication of Farm Bulletin No. 1 entitled, "The Baby Chick," by the Puget Sound Power & Light Company, Seattle. This is a 40-page, attractively printed and illustrated booklet in which is compiled by Mr. Scott a variety of information of interest to the poultry-raiser. Articles on raising and feeding chicks, and treating their ills are interspersed with articles explaining how to construct different kinds of yards and housing, and on the installation of suitable equipment. Contributors are George R. and Mrs. Shoup, poultry specialists, and J. W. Kalkus, veterinarian, Western Washington Experiment Station, Puyallup; J. S. Carver and L. W. Cassel, division of poultry husbandry, Washington State College, Pullman; and M. G. Cushing, Puget Sound Power & Light Company, Seattle.

A glance at the titles of the articles presented will give an idea of the scope of the bulletin. These are "Pedigreed Chicks;" "Baby Chicks;" "Chicken Rations;" "Eradicating Bacillary White Diarrhea in Washington;" "Coccidiosis in Chickens;" "Equipment for Raising the Chick;" "Concrete Yards;" "Stovepipe Brooders Have Merit;" "Pullet Development or Colony House;" "Perching Chicks Easily;" "Let Us Keep Our Livestock Comfortable;" and "Raising Chicks by Electricity." Each of the chapters is illustrated profusely with photographs and drawings, and bills of material are given in those instances in which are explained methods of construction. Wiring tables to show the size wire to use for circuits carrying a given load a certain distance, and the length and weight of resistance wire to use for given wattages, also are included.

The opportunity to circulate company advertising through the distribution of the bulletin is embraced by using the inside of the front cover and both sides of the back cover. One of these pages is devoted to a short but pertinent discussion of rural electrification, in which is brought out the relation of rural rates to a proper balance between conservative power development and economic power use. The other pages are given over to dignified and attractive advertisements, one for the company's preferred stock offering and the other for its electric service. The latter stresses the value to the farmer of employing the electric motor for all work possible so as to release his own energies for planning, organizing and directing the work of others.

Oakland, Calif., to Survey for Power Sites on Mokelumne

The Chamber of Commerce of Oakland, Calif., has engaged Lester S. Ready, chief engineer of the California Railroad Commission, to conduct a survey of the upper Mokelumne River for sites suitable for developing power in connection with the proposed municipal water-supply project of the East Bay Municipal Utility District. The power developed would be used to help pay the cost of the water-supply project.

The East Bay Municipal Utility District is comprised of Oakland, Berkeley, Alameda, Piedmont, Richmond, San Leandro, Albany, Emeryville and El Cerrito. It plans to secure a domestic water supply by the erection of a dam on the Mokelumne River at Lancha Plana about 30 miles northeast of Stockton to impound the water and the construction of an aqueduct about 90 miles long from the dam to reservoirs now supplying the East Bay district. A bond issue of \$39,000,000 was voted Nov. 4, 1924, to defray the cost of developing the first unit.

Three Plans for Development of Sacramento Water Supply

Three plans for the development of a mountain water supply for the Municipal Utility District of Sacramento, Calif., from the Silver Creek drainage basin have been presented to the board of directors of the district.

Under plan No. 1 it is estimated that the cost for delivering 70,000,000 gallons of pure mountain water per day, which would be sufficient for a population of 250,000, would probably be \$10,600,000. This plan does not provide for the installation of power houses along the aqueduct, but is the basic cost of water delivered to the district and would materially increase the present cost of water service in Sacramento.

Plan No. 2, which is estimated to cost \$14,800,000, contemplates the development of power along the aqueduct at three lower stations. These would provide 14,200 hp. and would deliver 80,000,000 to 85,000,000 kw-hr. annually to substation terminals for the district. The revenue received from this power probably would not reduce the cost of water in Sacramento to its present level.

Plan No. 3 contemplates delivering 200,000,000 gallons of water per day into Sweetwater reservoir and 70,000,000 gallons from that point to Sacramento and would permit the generation of 91,534 continuous horsepower. The estimated cost of this project is \$27,100,000, exclusive of an electrical distribution system. This installation would place 475,000,000 to 525,000,000 kw-hr. at the substation terminals. The engineers believe that if proper agreements can be made with power companies for the sale of this power, a pure mountain water supply could be delivered to Sacramento for approximately the present cost of water.

The consulting engineers on the project, William Mulholland, W. D. Mead, C. E. Grunsky and R. E. McDonnell, have requested definite information as to the possible revenue that may be derived from the sale of power that may be generated from the developed water

supply of the district. The information is requested as a guide in their deliberations as to whether the district shall develop or distribute electric energy, or lease the use of this developed water to private companies, who would install the necessary power houses and appurtenant works for the development of power.

To obtain the necessary data the district board adopted a resolution appointing a committee of three members with authority to take the matter up with any and all power companies operating in the territory and to report back to the board with recommendations at the earliest possible time.

Refrigerator Distributors of San Francisco Organize

At a meeting held in San Francisco at the Palace Hotel, April 13, attended by thirty-eight men vitally interested in the development of electric refrigeration in that territory, an organization was formed looking toward the development of the electric refrigeration market in northern California. Distributors of eight electric refrigerator manufacturers and of the three central stations serving the territory were in attendance.

The meeting was called at the request of J. Robert Crouse, the founder of the Electric Refrigeration Manufacturers Council, and vice-president of the Electric Refrigeration Corporation. Mr. Crouse explained the organization of distributors that has been formed in Cleveland and expressed the hope that a similar organization might be formed in San Francisco.

F. E. Hazard, chairman of the advertising committee of the Electric Refrigeration Manufacturers Council, and advertising manager of the Servel Corporation, told of the code of ethics that has been adopted by the Electric Refrigeration Manufacturers Council and of the aim of the advertising committee to sell electric refrigeration instead of any particular make of electric refrigerator.

A. K. Baylor of the General Electric Company presented an extremely interesting resume of the electrical refrigerator as it affected the housewife.

Mr. Baylor also told of the benefit that accrued to the power company.

It was unanimously agreed that there was a need for a distributors' organization in San Francisco, this organization to work in co-operation with the California Electrical Bureau. R. E. Fisher, vice-president in charge of public relations and sales of the Pacific Gas and Electric Company, was elected chairman; F. H. Woodward, general sales manager of the Great Western Power Company, vice-chairman; and Victor W. Hartley, secretary of the California Electrical Bureau, was named secretary.

Mr. Fisher announced that it was his opinion that this organization should function in a state-wide capacity, operating in conjunction with the California Electrical Bureau, and the suggestion was accepted by the gathering.

New Company to Serve Residents on Mountain Highway

To serve electric power and light to a number of small communities, farms, country homes, roadside garages, hotels and stores lying along and in the vicinity of the Mt. Hood Loop Highway in Clackamas County, Ore., the Loop Electric Corporation, Portland, has been formed by local people and with the following officers: George A. Curtis, president; U. E. Nelson, vice-president; F. K. Masters, secretary; C. M. Williams, treasurer; and J. W. Myers, additional director. The company will buy power at Sandy, Ore., from the Portland Electric Power Company and extend a three-phase, 11,000-volt main line from that point about twenty-five miles east to a point beyond Rhododendron in the Mt. Hood National Forest. Leading off from this line will be 6,600 and 2,300-volt laterals sufficient to reach all the business in the territory.

Financing will be effected in the main through the sale of preferred stock, much of which is expected to be subscribed by prospective customers. Some additional assistance in the construction of laterals is expected from prospective customers served by such laterals. Construction work on the main line has been started.



Employees Public Relations Council of the Public Service Company of Colorado recently established to devise ways and means better to serve the public. (See Journal of Electricity, April 1, 1926, p. 258.) Sitting, left to right—O. L. Mackell, E. R. Johnson, J. A. Miller, G. B. Buck, Earl Johnson, Charles Sharland, Robert Kelly, T. J. West, Clare N. Stannard, vice-president and general manager; A. A. Klinge, William B. Walters, R. G. Munroe, C. A. Bigler, Earl P. Hodges, Charles H. Elliott. Standing—T. M. Foulk, Frank R. Jamison, R. G. Gentry, chairman of the council.

News Briefs

Street Illumination of Everett, Wash., to Be Increased 53 Per Cent.—The city of Everett, Wash., is to get a 53 per cent increase in illumination of its streets without added cost, due to the acceptance by the city of the contract with the Puget Sound Power & Light Company to furnish 1,133,000 units of light at street intersections for the next five years, instead of 739,000 furnished heretofore. Hundreds of street intersections will have double the present lights. The cost under the new contract will be \$1,023.12 per month, a reduction of 28 cents from the old figure.

Six U. S. C. Students to Be Trained at Schenectady Plant of General Electric Company.—Six senior students from the University of Southern California have been chosen by the General Electric Company to be trained for positions of responsibility at the company's plant at Schenectady, N. Y., according to Philip S. Biegler, professor of electrical engineering at the university. Paul Churchill, Walter Scott, Charles Little, William Hogue, James Shidler and Burdette Ives are the senior students chosen.

Two Applications to Federal Power Commission.—The Oroville-Wyandotte Irrigation District has applied to the Federal Power Commission for a preliminary permit covering a power project on the South Fork of the Feather River in Butte and Plumas Counties, Calif. Two plans of development are proposed. Under the first plan there would be five power houses which would develop a maximum of 80,437 hp. Under the alternate plan there would be three power houses developing a total of 74,625 hp. The Tongass Power & Light Company, of Hyder, Alaska, has applied for preliminary permits, one on the Soule and the other on the Salmon River. Both are in the Tongass National Forest.

Railroad Shops in Casper, Wyo., to Have Fuel Oil Electric Generating Plant.—A fuel oil electric generating plant will be built by the Chicago, Burlington & Quincy Railroad at its shops in Casper, Wyo., according to an announcement of F. G. Gurley, general superintendent at Alliance, Neb. The estimated cost of the improvement is \$80,000.

Edison Company Starts Work on Huntington Park Substation.—Work has been started on a new \$150,000 substation to serve the Huntington Park territory of the Southern California Edison Company. This new station, which is to be 49 ft. by 79 ft. in outside dimensions, is to be located at the northeast corner of Rugby and Zoe Avenues, and will be built of reinforced concrete throughout. It is planned for an ultimate capacity of 18,000 kw. In keeping with the company's policy, the structure will be built to harmonize as closely as possible with its surroundings.

San Diego Utility Applies for Permit to Issue Common Stock and Pay Common Stock as Dividend.—The San Diego Consolidated Gas & Electric Company has applied to the California Railroad Commission for authority to issue and sell \$2,000,000 par value of its common stock at par, and also for permission to pay dividends on its outstanding common stock in the shape of common stock of the proposed issue. In its application the company states that the proposed stock will be issued for the purpose of reimbursing itself for earnings previously diverted to uncapitalized construction expenditures and to refund money borrowed on promissory notes also for construction purposes.

Irrigation District and Power Company in Conflict over Application for Water Permit.—The Ojai Irrigation District, of California, has applied to the Federal Power Commission for a preliminary permit covering a 5,000-kw. project on Sespe Creek and the Ventura River in Ventura County, Calif. It is proposed to erect a dam 180 ft. high in Sespe Creek. The water would be carried 8.2 miles in a conduit to the power house. This application conflicts with that of the Ventura Power Company.

Wyoming Utility Sold.—The Hot Springs Light & Power Company of Thermopolis, Wyo., has been sold to the Monument Hill Electric Company, a recently incorporated company headed by R. J. Ireland of New York City. Mr. Ireland is president of the First National Bank of Thermopolis and of the Owl Creek Coal Company at Gebo, Wyo. The H. P. Rothwell interests also are associated in the new company. The sale was made by the Singer Securities Corporation. H. B. Morgan will continue as local manager. The new company has been granted a fifty-year franchise.

Pacific Power & Light Company Plans Extensions and Improvements.—The Pacific Power & Light Company, Portland, announces that a new power line to carry 6,600 volts will be built into the Prospect Point district in Walla Walla, Wash., in 1926, while a new loop circuit from the Walla Walla substation to the industrial district north and west to the penitentiary is in the company's plans for this fall. The company is expending about \$65,000 in extensions to various parts of the city, and the year's expenditures will reach \$100,000 for additions and improvements to its system.

Portland Company Connects Newly Acquired Property to its System.—With the completion of an 11,000-volt line approximately eight miles long from Scappoose to St. Helens, Ore., the Portland Electric Power Company, Portland, recently began to serve St. Helens from Portland. This property, formerly served from the local power plant of the St. Helens Lumber Company, was acquired last year by the Portland company (Journal of Electricity, Nov. 1, 1925, p. 353) with the expectation of extending a line to serve it from the existing system. The new line is constructed for operation at 66,000 volts but for the time being will be operated at 11,000 volts.

Wynooche League States Objects.—The Wynooche Water and Power League of Aberdeen, Wash., recently organized to promote the Wynooche water and power project development by the city of Aberdeen, has set forth its objects as follows: To secure the registration of all qualified voters; to secure submission to the qualified voters of a proposition to develop the power resources of the Wynooche by the people of Aberdeen as a municipal enterprise; to secure new enterprises by offering an abundance of cheap power and water as an inducement; to enter actively into any campaign which has for its purpose the development of water and power resources of the Wynooche River by the city. The life of the league is to continue until there actually has been constructed and in operation by the city of Aberdeen a municipally owned water and power system on the Wynooche River. Any person who is a qualified voter is eligible to membership.

Preliminary Permit Granted for Power Project on Hat Creek, California.—The Federal Power Commission has granted to the Red River Lumber Company of Minneapolis, Minn., a preliminary permit for eighteen months for a power project on Hat Creek, Shasta County, Calif. The project consists of a dam designed to divert 200 sec.-ft. of water through a flume to a power house about 3.4 miles from the dam. The power to be developed, estimated at 6,500 hp., will be used in manufacturing operations.

Utility Files Protest Against Encroachment.—A protest has been filed with the Arizona Corporation Commission, Phoenix, by the Arizona Edison Company against the Yuma Utilities Company. The latter is charged with encroachment in the furnishing of electric current to the new Southern Pacific Railroad station at Yuma. It is claimed that the utilities company has authority only outside the Yuma city limits.

A. I. E. E. News

Seattle Section, A. I. E. E. Inspects New Substation.—The Seattle section, A. I. E. E., was recently the guests of the Puget Sound Power & Light Company at the company's new substation in the East Pine Street district, in that city. Members were taken on an inspection trip through the plant. Joseph Hellenthal spoke on "Automatic Substations."

Los Angeles Section will meet May 4 at the City Club, 833 South Spring Street. Dinner will be at 6:30 p.m. and will be followed by an illustrated lecture on "The Astronomical Research Work of the Mount Wilson Observatory," by Dr. Ferdinand Ellerman. This is to be the last meeting of the section prior to the vacation period. Women are cordially invited.

Pacific Coast Electrical Association

Busy, Pleasant Time Forecast by P.C.E.A. Convention Plans

Fine progress is reported in the plans for the Pacific Coast Electrical Association convention at the Hotel Biltmore, Los Angeles, June 8-11, 1926.

Section chairmen are urged to get the final details of their programs into the hands of Ralph A. Hopkins, Westinghouse Electric & Manufacturing Company, chairman of the program committee, as soon as possible, Tuesday afternoon and Wednesday afternoon have been reserved for the various section meetings.

While it is too early to give final details of the program for the general sessions, the tentative plans call for a number of speakers of national repute and eminence in Pacific Coast affairs. Men qualified to discuss the business and economic situation have been enlisted. Thoughtful discussions of electric cooking and heating, electric refrigeration and electric elevator systems already are provided for definitely.

The general session of Friday morning will be a women's program—not a women's meeting, for all are expected to attend, but a women's program. Some very interesting information on women's participation in the affairs of the industry will be forthcoming at this time.

The Annual Banquet

Friday evening, June 11, will be the occasion of the annual banquet. R. E. Smith, James Loomer and W. A. Knost as The Three Banqueteers will have charge of the festivities and will be assisted by P. P. Pine, George Bigelow and Eugene McCann. The banqueteers are working on the theory that if all they plan takes place the committee next year will have a hard time to produce something better.

Golf in reasonable quantities, is recognized as a necessary convention accessory. There will be golf, for all who desire that form of education. A visit to one of the motion picture studios is assured for the ladies while the men golf.

While the convention officially closes Friday evening, The Southern Sierras Power Company will be very glad to have as many of the delegates as possible drive to Riverside and enjoy luncheon and golf, also other entertainment, at one of the country clubs in that vicinity.

Very definite opportunities will be offered to the women attending the convention to take part in an important meeting at which problems of particular interest to the women attending the convention will be discussed by prominent speakers. This will be followed immediately by a business luncheon for the women attending the convention.

The entertainment committee assures the ladies it is making plans so that

the convention will be not only instructive but enjoyable in every way to those who are fortunate enough to attend, and it hopes there will be a large representation of women so that the men will have plenty to do to keep them busy.

Technical Section Closes Administrative Year and Prepares Next Year's Program

Intensive activities of the Technical Section of the Pacific Coast Electrical Association for the current year were brought to a fitting close at the Fresno conclave April 7-9. With a bona fide attendance of something in excess of 150 the conclave was one of the heaviest in the history of the section.

Contact with the N.E.L.A. committees and the work of the eastern geo-

Correction for Meter Committee Serial Report

"Low-Cost High-Tension Metering for Operating Purposes," serial report of the meter committee, P.C.E.A., appeared on page 295 of the April 15 issue of the Journal of Electricity. The heading reading "Ratio Error" should read "Ratio Correction Factor." The corrected manuscript was received in the Journal office too late to incorporate the change in the original article, so that this is the first opportunity available to effect this correction.

joint sessions involved the apparatus, overhead, safety rules and inductive co-ordination committees; the subjects under discussion were grounding, transformer standardization, and supervisory control. One of these joint sessions was held the evening of the first day of the conclave and the other the afternoon of the final day. The committees involved thus were enabled to carry out their regular work without interruption and then get together for the joint business. Reports from the delegates to the eastern meetings were presented to the section assembled in special session Thursday evening, April 8.

Mr. Baurhyte Praises Section

William Baurhyte, president of the P.C.E.A. and president of the Los Angeles Gas & Electric Corporation, gave an interesting address to the section assembled for luncheon at the Fresno Hotel, Thursday noon, April 8. Mr. Baurhyte spoke appreciatively of the value of the work of the Technical Section to the industry as a whole. According to his own statements, some of the most effective and lasting economies and aid to better service have been the direct result of the un-failing and continued efforts of the Technical Section committees in their studies of the design, construction and operating problems of the industry.

As usual the San Joaquin Power Club came forward and gave all of the delegates to the Fresno meetings a most enjoyable evening Friday, April 9, after the close of all the business sessions. In addition to this, there was a trip to the Balch project of the San Joaquin Light & Power Corporation that was enjoyed by all those that took advantage of it. Many side trips to substations and other points of interest in and around Fresno were available to the men and added to the enjoyment and instructiveness of the conclave.

All arrangement details for the Fresno conclave were cared for by or through L. J. Moore, of the San Joaquin Light & Power Corporation and past chairman of the Technical Section. He was extended a vote of thanks by the section for his program.

Business Sessions

The business sessions of the various committees best are covered by the summaries submitted by the respective committee chairmen. Therefore these are presented as follows:

All Aboard for P.C.E.A. Convention

The Southern Pacific Company has offered for the accommodation of members of the electrical industry in northern California who are planning to attend the P.C.E.A. convention a special train to Los Angeles for 100 fares. By routing the train through the San Joaquin Valley residents of Sacramento, Stockton and Fresno will be given an opportunity to patronize the "special." A round-trip fare from San Francisco of \$17.05 is offered, passengers to go to Los Angeles on the special train and return by regular train, with Pullman fare of \$9, making a total of \$26.05. The train will be of the first class, with diner, observation car, club car, and similar equipment.

Reservations for accommodations on this train must be made at once with Samuel H. Taylor, secretary, P.C.E.A., 447 Sutter Street, San Francisco.

graphic divisions in general is proving of immense value to the Pacific Coast engineers and operating men of the P.C.E.A. Delegates to the general meetings of the Technical National Section brought information regarding Eastern practices and presented a general resume that served to keep the P.C.E.A. members in touch with the other fields. Continued close co-operation between the Pacific Coast and the other geographic divisions is bound to result in mutual benefit to all concerned and of particular benefit to the P.C.E.A. member companies.

Special and Evening Meetings

Joint meetings were held wherever two or more committees were interested in the same subjects. These

Accident Prevention Committee

By J. M. BUSWELL, San Joaquin Light & Power Corporation, Chairman

There were 38 members in attendance and discussion was lively and interesting.

Some final discussion was had on the following papers which already have been sent in for the convention issue of the Journal of Electricity: Safety Bulletins, Apparatus and Devices, Identification of Cables in Manholes, and Safe Practices.

A paper on The Foreman was read and there was some discussion. Reference was made to the March issue of Labor Review which includes an article and a code of ethics. The point was emphasized that the foreman is a key man and that one general fault made by foremen is that they do not tell the men what is wrong with them and too seldom praise them for achievement.

Accident statistics was discussed as a subject which should have particular attention in the work of this committee next year. A few additional tools for reducing accident hazards were submitted by Mr. Redinger as developed on the Big Creek construction work of the Southern California Edison Company.

A method of loading, unloading and transporting poles was reported by Messrs. Dickinson and Jordan of this company. It was agreed to have this published with the papers of this committee this year. Dickinson and Jordan also presented an outline or draft of Safe Practices or Accident Prevention Code. After discussing this it was agreed to recommend this subject for next year's continued work.

Under the general subject of tools the matter of the care of rubber gloves was discussed. First-aid supplies, investigation of accidents, the advisability of monthly meetings of superintendents and assistants, the need of statistical charts and the advantages of local committees were discussed.

Three applications for Insull medals, now in process of investigation, were reported by the chairman. Attention also was drawn to the N.E.L.A. Bulletin for March, 1926. This is the national accident prevention number.

The proceedings of the national accident prevention committee were reported and discussed.

Electrical Apparatus Committee

By J. C. GAYLORD, Southern California Edison Company, Chairman

About 100 members and visitors attended the meetings of the apparatus committee on April 8 and 9.

A short report of the Kansas City meeting of the national apparatus committee was presented by the chairman, in which was evidenced an effort by operating companies throughout the country to make their urban substations noiseless in operation and attractive in appearance.

Papers were presented on distribution substation design as currently used by the Pacific Gas and Electric Company, on special relay applications recently made by Pacific Coast companies, and on the design and operation of oil circuit breakers on this coast.

Consideration was given to the motor rules recently adopted by the Power Club, it being recommended that serious consideration be given to the adoption of these rules by all Pacific Coast operating companies.

Two talks were given by representatives of the manufacturers, one on the subject of static condensers and the other covering the design and operation of ratio changers for changing transformer taps under load.

Joint meetings were held with the overhead systems committee and safety rules committee on the subjects of transformer voltage standardization and grounding, and with the inductive co-ordination committee on the subject of supervisory control.

The following subjects were chosen tentatively for study during the coming year:

1. Oil circuit breakers.
2. Relays.
3. Substation design practice.
4. Fire protection and prevention.
5. Operating methods, routine and facilities.
6. Transformers and regulators.

Hydraulic Power Committee

By WALTER DREYER, Pacific Gas and Electric Company, Chairman

Clinton de Witt presented a report of the meeting of the national committee at Kansas City. A resolution was made endorsing the stand taken by the parent committee in urging the adoption of a standard draft tube to serve as a "yardstick" or basis with which to compare the performance of other tubes.

The report on "Discussion of Penstock Design and Operation," which was practically complete, then was read and discussed. It was agreed to add to the study which had been proposed at the previous meeting by including more data on air valves and flanged joints and more study on welded pipe before sending the report to the national committee as the contribution of this geographic section to the serial report on this subject.

H. K. Fox, of the San Joaquin Light & Power Corporation gave an illustrated talk on the Kings River project of that company, placing particular emphasis on the Balch development which, when complete, will be the highest head plant in America.

R. S. Quick of the Pelton Water Wheel Company continued his very interesting study on the theoretical side of water hammer. His work since the January meeting has been of a highly constructive nature, resulting in the production of a chart from which the maximum value of the pressure rise readily can be determined in a few minutes where the old step-by-step arithmetical integration method took as many hours.

The national committee is making a statistical study on the mechanical reliability of hydro plants. This work had been summarized for this division for the years 1924 and 1925. E. A. Crellin presented an interesting analysis of the causes of outages, dividing the machines into three groups, i.e., impulse wheels, vertical reaction turbines and horizontal reaction turbines. The necessity for further detail in explaining outages was pointed out, it being felt that otherwise injustice may be done to both the type of installa-

tion and the manufacturer. This study is to be continued for at least four more years, and by that time the study will have run a sufficient length of time to warrant definite conclusions as to the points of greatest and of least reliability in this field.

The last session, with J. M. Gaylord of the Southern California Edison Company and vice-chairman of this committee presiding, was devoted to a discussion of new subjects to be studied next year. In line with the new policy of the Technical Section it is intended to begin this study immediately, carrying it through the summer months and permitting a more nearly constant load-factor in this work. The subjects for study are as follows:

1. Handling of stored water.
2. Continuous measurement of water in open and closed waterways.
3. Water level indicators.
4. Operating experience with trash racks.
5. Pressure tunnels.
6. Penstock valves.
7. Continue study on mechanical reliability of hydro plants.
8. Continue study on "Evaporation Losses from Reservoir" by H. W. Cummings of California Institute of Technology.
9. Experiments on water hammer.
10. Continue study on prevention of silt deposits in conduits.

Inductive Co-ordination Committee

By H. N. KALB, San Joaquin Light & Power Corporation, Chairman.

Meetings were attended by twenty-four delegates and visitors. D. I. Cone, transmission and protection engineer, Pacific Telephone & Telegraph Company, gave a talk on the term "parallel" and showed that the curves published in connection with technical report No. 71 of the inductive interference report were used by the telephone company only as a guide to tell when to consider the possibility of interference being experienced.

In the discussion of radio interference it was stated the Pacific Radio Trade Association is starting a campaign which would take care of many troubles not caused by the power companies but commonly attributed to them. Although this applies to large cities the radio clubs in medium-sized centers and the co-operation of local dealers in small towns are beginning to give favorable results.

The day's work was concluded with considerable discussion on carrier telephone systems.

On April 9 in a joint meeting with the apparatus committee the uses and operation of remote supervisory control were discussed. As this subcommittee only recently has been organized no definite conclusion or recommendations were made. A tentative outline was made as to the program that will be followed to collect data that will be of very great value to operating companies.

Meter Committee

By R. G. JONES, The Southern Sierras Power Company, Chairman

The meter committee held morning and afternoon sessions on April 7 and 8 with an attendance of some twenty-five.

Reports from all subcommittee chairmen were handed in, and each report

was read and a general discussion followed.

The committee on education of meter men had a very good report in that a particularly successful metermen's short course was held at the California Institute of Technology at Pasadena during the past month. Another class has been arranged for at the University of California at Berkeley and will be held May 17-22.

Reports as covered by the subcommittee chairmen have some important information that is pertinent not only to men directly concerned with meter operation but the various departments charged with operation, distribution and engineering of the utilities properties and plants, and it is the sincere hope of the meter committee that these departments will make use of this information.

Some additional work has been outlined for the meter committee, and by this work we hope to broaden the scope of our activities during the coming year.

Overhead Systems Committee

By G. A. RILEY, Los Angeles Gas & Electric Corporation, Chairman.

All of the Fresno sessions of the overhead systems committee were well attended. Reports were submitted for publication on the following subjects:

- Testing of high-voltage insulators in service.
- Live-line maintenance.
- Bare wire for distribution.
- Life of treated and untreated poles.
- Distribution transformer standardization.
- Grounding of primary and secondary lines.

The last two reports were presented at a joint session of the overhead systems committee, apparatus committee and safety and safety rules committee. These subjects were studied jointly by the three committees.

Lively discussion followed the presentation of each of the reports indicating that there is much work yet to be done on a number of them. The study of the Life of Treated and Untreated Poles has been the means of awakening a number of utilities to the fact that termites are much more prevalent than it was supposed before careful investigation was started. From present indication it seems that full-length treatment of the poles is desirable, as well as the treatment with creosote of the crossarms and wooden pins.

A progress report was presented by the subcommittee appointed to study the proposed standard gage for 1-in. pin holes in insulators in which several members had reported the gage as satisfactory. In the discussion, however, it seemed evident that the subject should be studied further, and it was recommended that the committee be continued, including recommendations for a pin gage also, which the discussion showed to be desirable. In addition to the above subject the following subjects were proposed for consideration by the committee in their next year's work:

- Details of construction.
- New 220-kv. construction.
- Maintenance of steel poles and towers.
- Grounding of primary and secondary lines.
- Study of pole life.

The last two are a continuation of this year's subjects.

Prime Movers Committee

By J. W. ANDREE, Southern California Edison Company, Chairman

The prime movers committee held its Fresno meeting in two sessions on April 7. Reports of the minutes of the Kansas City and Boston meetings of the N.E.L.A. prime movers committee were read.

Final reports on the following subjects were read and discussed:

- Condensing equipment.
- Burning of liquid and gaseous fuels.
- Heat balance and auxiliaries.

The condensing equipment report has been published as a serial report appearing in the Journal of Electricity April 1, p. 259. The other two reports will appear in the June convention issue of the Journal.

Preliminary reports were rendered on Cooling Towers and Spray Ponds and Standby Plant Design. Final report on Cooling Towers and Spray Ponds will be made before June 1, and this will appear as a serial report of the committee.

Standby Plant Design is being combined with Standby Plant Operation as a new subject for investigation by next year's committee. Other new subjects to be studied by next year's committee are Treatment of Boiler Feed Water and Boilers, Furnaces and Accessories.

In addition to these new subjects, next year's committee will continue studies on:

- Condensing equipment.
- Burning of liquid and gaseous fuels.
- Heat balance and station auxiliaries.

At the conclusion of the meeting the chairman read an interesting paper on system operation, dealing with the economical phase of operation of steam and hydro plants. This paper will be published in the near future in the Electrical World.

Safety Rules Committee

By W. R. FRAMPTON, Southern California Edison Company, Chairman

Several committee members had submitted data covering test requirements which were presented and discussed at length. The discussion became quite general on the possibility of standardizing on a definite test device. It was suggested that at least an endeavor be made to take definite action on a switch providing testing facilities for installation requiring switches up to and including 100 amp. 600-volt capacity.

A resolution was passed unanimously favoring incorporating isolation-test devices on switches up to and including 100 amp., 600-volt capacity. This represents a definite accomplishment and gives a basis upon which to build future action.

The committee listened to an address by H. W. Stitt, city electrician of Fresno, also past president of the California Association of Electrical Inspectors, on the subject of co-operation of the inspectors with this committee on standardizing and increasing scope of inspection in the state.

One manufacturer submitted a switch with test devices that was correct in

principle but would need some modifications in mechanical design. Manufacturers will be asked to submit switches with test devices in accordance with specifications as outlined by the committee.

Underground Systems Committee

By P. E. CHAPMAN, Pacific Gas and Electric Company, Chairman

Transformer Vault Location and Design for Heavy Loads was the opening topic discussed in the underground systems committee. Short reports covering this important subject were given by H. G. Keesling, R. P. Lutz, A. J. Theis and C. H. Jenkins of the committee. Blueprints were submitted giving the size of transformer vaults together with the location of the equipment installed in them.

An interesting paper was presented by H. C. Moyer covering the design of a manhole ventilated by means of an air shaft built outside of and along the hole to be cooled.

Prevention of electrolysis on electric underground cables was covered in a report by Paul Suransky, taking an actual case of trouble which occurred and explaining how it was corrected.

B. A. Williamson, of the Los Angeles Gas and Electric Corporation, reported on his experiences in electrolysis surveys in the city of Los Angeles. He brought out many points of interest, a number of which will be recommended by this year's committee for study next year.

The association which has been formed in Oakland to follow electrolysis was explained by Mr. Moyer. This association handles all electrolysis work for the various utilities which are members and has functioned very satisfactorily.

G. H. Hagar rendered a report on the maintenance of the submarine cable of the Great Western Power Company that extends from San Francisco to Brooks Island. The report was extremely interesting as this is the first installation in San Francisco Bay where no lead armor is used.

A number of submarine power cables in San Francisco Bay have been installed by A. J. Pahl. Mr. Pahl gave a short talk on his experience in the installation of them. His comparison of submarine cable with and without lead armor was very instructive. A number of X-Ray photographs were submitted by N. B. Hinson of the Southern California Edison Company. These were taken in Seattle by M. T. Crawford of the Puget Sound Power & Light Company, and presented a new method for the detection of faulty rubber insulation on submarine cables having no lead armor.

Determination of the temperature of underground cables and the apparatus used for this work was thoroughly covered in the papers explained by G. L. Hill. His talk was illustrated with a number of carefully prepared charts.

The national underground systems committee meeting held at Kansas City was reviewed fully by H. H. Buell who attended that session.

The chairman closed the meeting with a report of the year's work of his committee, suggesting possible subjects for next year's study.



News of the Electragists



Hardy sailors all? A number of the delegates to the convention of the California Association of Electrical Inspectors made the trip to San Diego from San Francisco aboard the Yale. Others from southern California boarded the boat at Los Angeles. It was a very pleasant trip, and no cases of seasickness were reported.

Left to right—C. D. ("Dent") Slaughter, Allied Industries, Inc., San Francisco; Will H. Davie, Allied Industries, Inc., Los Angeles; B. C. Hill, supervising electrical inspector, Oakland; George E. Kimball, Industrial Accident Commission, and Claude W. Mitchell, Board of Fire Underwriters of the Pacific, both of San Francisco.

Sacramento Contractors and Dealers Association Reorganizes

A reorganization of the Electrical Contractors and Dealers Association of Sacramento, Calif., has been effected as the result of a recent meeting held at the Travelers Hotel in that city. The speakers of the evening were George Eldridge, of the California Electragists, and T. S. Curran, Pacific Gas and Electric Company, who is district chairman of the Red Seal plan.

Mr. Eldridge outlined the purpose of the Red Seal plan and also talked on the subject of organization and co-operation, stressing the value of meeting together and discussing the problems of the business. Mr. Curran gave the details of the Red Seal plan and told how the power companies are co-operating with the electrical contractor

in selling more than an ordinary job of wiring to the public.

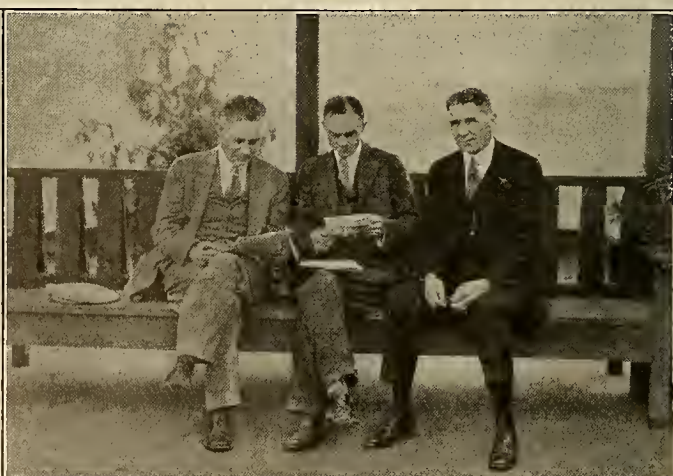
The first Red Seal home in Sacramento is being built by Frank Williams, a home-builder. C. F. Vining, Clifford Prudhomme, and L. M. Sherman were appointed as a committee to secure publicity for this house. It has been approved as one of the official homes to be displayed during Better Homes Week.

There are twenty-three members of the association. The officers are as follows: president—R. J. Finchley, California Mechanical & Electrical Engineering Company; vice-president—Carl F. Vining, Standard Electric Works, and secretary—E. M. Miller.

Colorado-Wyoming Electrical Contractors and Dealers Association formed at Meeting in Denver.—During the state-wide meeting of electrical men in Denver, Colo., March 26, the Denver

Electrical Contractors Association was host at a luncheon to all visiting contractors, and from that gathering a movement was started which resulted in the organization of the Colorado-Wyoming Electrical Contractors and Dealers Association. Matt Whitney of Colorado Springs was named president; W. A. J. Guscott, Denver, vice-president, and P. Harry Byrne, Denver, secretary and treasurer. Sixty-two contractors attended the meeting, twenty-nine from outside of Denver.

California Electragists to Meet in Sacramento May 21.—The next quarterly meeting of the Northern Division of the California Electragists will be held in Sacramento at the Hotel Senator on Friday, May 21. For the benefit of the delegates from the San Francisco Bay territory a special boat will leave San Francisco Thursday night, May 20.



A hardy group of inspectors at the convention of the California Association of Electrical Inspectors which was held in San Diego. Left to right—F. C. Colville, San Leandro; James M. Evans, Board of Fire Underwriters of the Pacific, Los Angeles; J. C. Hamilton, San Jose; Walter Scott, Burlingame; and W. E. Brothers, Berkeley.

Caught in the act of working! They chose a cosy spot on the roof of the Hotel San Diego, however, where it was very comfortable during the convention. From left to right—B. C. Hill, Oakland; R. H. Manahan, Los Angeles; and E. J. Crawford, San Joaquin Light & Power Corporation, Fresno.

Meetings

E. O. Shreve Honored at League Farewell Dinner

Tributes such as are given to few men were paid to E. O. Shreve by four noted speakers at a farewell luncheon given in his honor by the San Francisco Electrical Development League April 12. While the theme set for the day was centered about the idea that California is an ideal training school for industrial executives by reason of the great diversity of its industrial developments, speakers digressed from this thought to pay particular honor to Mr. Shreve, who has been promoted from San Francisco manager of the General Electric Company to the post of manager of the industrial department of the company with headquarters in Schenectady, N. Y.

W. E. Creed, president of the Pacific Gas and Electric Company, was the first speaker introduced by chairman of the day, C. E. Heise, manager of the San Francisco district office of the Westinghouse Electric & Manufacturing Company. Mr. Creed spoke of the heritage Californians received from the pioneers and emphasized the place that effort has in the building of character and leadership.

C. W. Banta, vice-president of the Wells Fargo Bank and Union Trust Company, the next speaker, analyzed the quality of friendliness which characterizes great men, investing Mr. Shreve with this quality.

A. B. C. Dohrmann, director of the California Development Association and well known merchant, spoke of the variety of interests in all California life which make for the broad training and outlook necessary to large industrial undertakings.

Dr. Thomas Addison, for long the head of the General Electric Company's Western work, gave an account of Mr. Shreve's history with the company from the time he began, during the days following the San Francisco disaster of 1906, when he dug post holes for a supply yard in Oakland, up to his present promotion. He took occasion to point out the various qualities that each new responsibility given Mr. Shreve had discovered in him.

Mr. Shreve in a brief response thanked his friends and associates.

A record attendance marked the meeting, over 400 being present to pay honor to Mr. Shreve. Delegations from Los Angeles and Oakland were present, and many notable men in the industrial life of the state were seated at the speakers' table.

Bureau Advisory Committee Meet Centers on Red Seal Plan

Effective measures for popularizing the Red Seal Plan to an extent that would justify its acceptance by builders and realtors as a sales feature in the houses they build was one of the important subjects discussed at the meeting of the advisory committee of the California Electrical Bureau held

in San Francisco April 12. It was agreed generally that one of the greatest aids in obtaining the desired result would be the appearance of several full-page advertisements in general media of national circulation, and steps have been taken to call to the attention of The Society for Electrical Development the need for such advertising, with the request that it be carried as an immediate national benefit to the Society's contributors.

A progress report showed that forty-two new Red Seal homes had been started in nineteen districts during March. Another report that caused much gratification was one which listed twenty-one electrical contractors who are contributing financially to the Bureau, evidencing the support that the contractors are rendering to the organization. It also was reported that a folder presenting the story of the

COMING EVENTS

National Electric Light Association—

Annual Convention—Atlantic City, N. J.
May 17-21, 1926.

California Electragists, Northern Division—

Quarterly Meeting—Hotel Senator
Sacramento, Calif.
Friday, May 21, 1926

Electrical Supply Jobbers' Association—

Annual Convention—Hot Springs, Va.
May 31-June 4, 1926

Advisory Committee, California Electrical Bureau—

Jonathan Club, Los Angeles, Calif.
June 7, 1926.

Pacific Coast Electrical Association—

Annual Convention—Biltmore Hotel, Los Angeles
June 8-11, 1926

Associated Manufacturers of Electrical Supplies—

Annual Convention—Hot Springs, Va.
June 7-12, 1926

Northwest Electric Light and Power Association—

Annual Convention—Spokane, Wash.
June 14-17, 1926

American Society of Agricultural Engineers—

Annual Convention—Tahoe Tavern,
Lake Tahoe, Calif.
June 23-26, 1926

Red Seal Plan in its appeal to architects, builders and realtors shortly would be off the press for distribution by district chairmen.

The Red Seal cards being used by the Los Angeles Gas and Electric Corporation as a direct follow-up in the interest of the Red Seal Plan on each residence job for which a permit is taken out in Los Angeles were discussed. An outline of the company's plan and a supply of the cards are to be distributed to all district chairmen.

Other matters handled at the meeting were the decision that notices of all meetings of the advisory committee be sent to all Bureau subscribers with an invitation to attend, and the appointment of A. H. Nicoll, sales manager, Graybar Electric Company, San Francisco, as chairman of the state advertising committee, succeeding M. W. Scanlon, resigned.

The next meeting of the committee will be held in Los Angeles, June 7, at the Jonathan Club.

Oakland Electric Club Elects Officers for the Year

Robert S. Prussia, salesman and district illuminating engineer for the Westinghouse Lamp Company, was elected president of the Oakland Electric Club at its meeting March 22. He will succeed Ben C. Hill, supervising electrical inspector of Oakland, Calif., president for the past year.

Other officers named were: Walter Vance, Pacific Electric Motor Company, vice-president; Joseph Marra, Pacific States Electric Company, secretary-treasurer; and Sam G. Gearhart, General Electric Company. Romaine W. Myers, consulting electrical engineer; U. N. Petersen, Quality Electric Motor Company; and Ben C. Hill, city of Oakland, were elected members of the board of directors.

Mr. Prussia in taking office announced that he would outline to the club at its first meeting in April a plan for strengthening the club organization and for building up the membership and attendance of the club.

Book Reviews

MANUFACTURERS OF THE STATE OF WASHINGTON

Published by the Manufacturers' Association of Washington, Silver edition (eighth) commemorating "The First Twenty-five Years" of organized work among industries of the state. Limp leather binding. 346 pages. \$7.50 postpaid. Manufacturers' Association of Washington, Arctic Bldg., Seattle, Wash.

An attractive directory, satisfyingly complete in all particulars, is the Silver, or eighth, edition of the Manufacturers of the State of Washington, just published by the Manufacturers' Association of Washington, Seattle. The book is called the silver edition in commemoration of the "first twenty-five years" of organized work among the industries of Washington.

Divided into three main sections, the directory provides an excellent cross-index of all manufacturing enterprises in the state. There are listed 5,145 enterprises, located in 524 different localities. There are in the new edition 36 per cent more firms than in the previous edition, and 226 more than that given in the federal enumeration in 1920.

Each listing is given in alphabetical order with addresses, telephone numbers, executive officers, capacities, number of employees and principal products. The first listing is in alphabetical order. This is followed by a geographical listing and later by a listing by commodities. In the latter the Washington factories are given 14,000 listings. Copyright features of the book include logging operations, the year the firm began producing, and in addition to the usual company officers, the credit, traffic and export managers, a list of brands and trademarks.

Personals

R. M. Alvord, since 1917 sales manager of the San Francisco office of the General Electric Company, has been appointed district manager for that company. He succeeds E. O. Shreve, now manager of the company's industrial department with headquarters



R. M. ALVORD

in Schenectady. Mr. Alvord's first sales experience was gained selling groceries in his father's store. He left that work to enter Iowa State College at Ames, from which he was graduated in 1904 with the degree of B.S. in electrical engineering. In that same year he entered the employ of the General Electric Company as student engineer. Two years later he was sent to the Pacific Coast as a supply salesman, and in 1910 he was made manager of the supply department. He held that position until 1917 when he was appointed sales manager of the San Francisco office. Mr. Alvord takes an active and enthusiastic interest in affairs of the electrical industry. He was one of the organizers of and always has been a leading spirit in the San Francisco Electrical Development League. He also was one of the leaders in the organization of the California Electrical Co-operative Campaign, now the California Electrical Bureau, and has served as a member of the advisory committee for many years. He has served on the executive committee of the Pacific Coast Electrical Association and on various committees of the Commercial Section of that organization. Some of Mr. Alvord's other interests and activities include a directorship of the Pacific States Electric Company and of the Pacific Coast Contract Purchase Corporation, of which latter he is vice-president, membership in the San Francisco Sales Managers Association, of which he was president in 1916, and membership in the Rotary, Commonwealth and Berkeley Country Clubs.

W. L. Frost, of the Southern California Edison Company, Los Angeles, made a recent business trip to Visalia.

F. L. Hansen, sales manager of the Ideal Electric & Manufacturing Company, Mansfield, Ohio, recently visited the Pacific Coast. While in San Francisco he conferred with A. J. Myers, district agent of the company, and returned to Mansfield by way of Los Angeles.

W. A. J. Guscott, prominent Denver electragist and official of the Electrical League of Colorado, has moved his office and shop from 1100 California Street to Room No. 1 of the Chamber of Commerce Building, 1726 Champa Street. The new location provides ground floor space double the old facilities and in the heart of the Denver business district.

Arthur P. Peck, formerly Sacramento representative of Fobes Supply Company, has been appointed manager of that company's Oakland branch. He has been succeeded by W. I. Powell, formerly in charge of the territory north of Sacramento. Dan O'Driscoll, who has had charge of radio for Fobes Supply Company in San Francisco, has taken Mr. Powell's place.

Leigh S. Jones, for many years purchasing agent of the California Oregon Power Company with headquarters in San Francisco, has resigned that position to establish himself as a general purchasing agent for industrial plants and others. Mr. Jones has opened offices in the Matson Building, San Francisco.

H. H. Allison, who has had charge of the kitchen lighting campaign on the system of the Great Western Power Company of California, has been made sales agent for Contra Costa County. He succeeds W. B. Sedgley, who has been advanced to the position of sales engineer in the Oakland district with headquarters in Oakland.

E. J. Willits, formerly assistant underground engineer, Bureau of Power and Light, Los Angeles, now is assistant electrical engineer for the Associated Oil Company of California, with headquarters in San Francisco.

E. D. Stewart, branch manager of the Westinghouse Electric & Manufacturing Company, El Paso, and W. G. Willson, manager of the company's Phoenix office, lately spent some time in Los Angeles for a brief business conference.

George Campbell, general manager Truckee River Power Company, Reno, Nev., visited San Francisco lately to attend the farewell dinner given by Carl F. Braun, of C. F. Braun Company, Los Angeles, in honor of E. O. Shreve, who has resigned as San Francisco district manager of the General Electric Company to accept the managership of the company's industrial department at Schenectady. S. E. Gates, Los Angeles district manager of the General Electric Company, made a special trip to San Francisco also to attend the dinner.

D. L. Huntington, president, The Washington Water Power Company, recently returned to Spokane from a six-weeks' trip to New York City and Washington, D. C.

A. N. Cudworth, assistant secretary and assistant treasurer, Northwestern Electric Company, Portland, recently resigned to become associated with the Robert Morton Organ Company, San Francisco.

Robert Davie, of the New York sales offices of the Graybar Electric Company, has been appointed district sales development specialist for the Western district, with headquarters at Kansas City, Mo. This territory includes the cities of St. Louis, Omaha, Denver, Salt Lake City and Memphis. Mr. Davie will be in charge of all engineering work in connection with the sale and installation of public-address equipment and other applications of electrical amplification apparatus.

L. M. McKey, until recently office manager for H. B. Squires Company, Los Angeles, has joined the staff of the Frank Adams Electrical Company of that city.

J. H. McCabe has resigned his position on the sales force of the Westinghouse Electric & Manufacturing Company in Denver to become associated with the American Ventilating Company in that city.

Charles Heston Peirson, or "Charlie" Peirson as he is known best, director of public information for the Southern California Edison Company, Los Angeles, has been appointed an assistant vice-president of that organization. Mr. Peirson, who entered the service of the Edison company about twenty years ago as advertising manager, is among the oldest professional writers in America, having commenced when a boy of fourteen as a waterfront reporter in New York City, and is now in his sixty-seventh year. While a war correspondent during the Spanish-American war, he accompanied the expeditionary forces of the army to San Juan, Porto Rico, and was admitted to the bar of the United States Court under the provisional government but never practised. He came to the service of John B. Miller, president of the Edison company, after long experience



CHARLES HESTON PEIRSON

in editorial and executive positions in the general offices of the Associated Press in New York City and with metropolitan papers in the East. The years he has spent with the Edison company have been coincident with its absorption of many other companies into its present organization. He is best known to the newspaper publishers as the originator of the Edison plan of display advertising, which has been adopted very generally and standardized by the larger public utilities of the country.

W. R. Putnam, vice-president and general manager, Idaho Power Company, Boise, recently made a business trip to San Francisco.

J. Robert Crouse, vice-president, Electric Refrigerator Corporation, and a director of the Society for Electrical Development, Inc., paid a visit to San Francisco a short time ago for the purpose of organizing local electric refrigerator distributors in order that they might tie in with the general sales promotion campaign for electric refrigeration now under way under the auspices of the Society for Electrical Development. Mr. Crouse recently was awarded the McGraw Medal for co-operation.

J. G. Hawkins, recently named assistant secretary and assistant treasurer, Northwestern Electric Company, Portland, to succeed A. N. Cudworth, resigned, went to that office from the position of assistant treasurer, Portland Gas & Coke Company and Pacific Power & Light Company, Portland, which he had held since early in 1926. He was born in Kent, Ohio, 1886, and after going through the public schools of Cuiahoga, Ohio, he entered the employ of the Northern Ohio Traction & Light Company, Akron, in 1903. In September, 1904, he went to Portland, entering the accounting department of the Portland Consolidated Railway Company, and remained with that company and its successor, the Portland Railway, Light & Power Company, until 1909. In May of that year he took a position with the Astoria Electric Company, Astoria, Ore., one of the properties that was consolidated with the incorporation of the Pacific Power & Light Company in June, 1910. Coincident with the formation of this new company, Mr. Hawkins was transferred to the Portland office, and successively has held the positions



J. G. HAWKINS

of chief clerk at Portland office, traveling auditor, chief engineering accountant, statistician, and assistant treasurer. Since 1918 he has been a joint employee of the Portland Gas & Coke Company, whose controlling interests likewise control the Pacific company. Since the same interests now direct the affairs of the Northwestern Electric Company, Mr. Hawkins' present appointment is a promotion to larger responsibilities coming after seventeen years continuous service to those interests.

E. L. Trowbridge, formerly connected with the Southern Electrical Company, San Diego, Calif., now is associated with the Southern California Edison Company, Los Angeles.

E. M. Herr, president of the Westinghouse Electric & Manufacturing Company, recently spent two days in Seattle and spoke before the Chamber of Commerce members' council at its weekly meeting.

J. L. Stannard, chief engineer of the Lake Cushman power project of the city of Tacoma, recently spoke before the Seattle Engineers' Club on the Lake Cushman development.

A. G. Wishon, president, San Joaquin Light & Power Corporation, Fresno, Calif., accompanied by Mrs. Wishon, left recently for a trip to Europe.

T. S. Louttit, attorney of Stockton, Calif., has been appointed by Governor Richardson as a member of the California Railroad Commission to fill the unexpired term of the late George D. Squires.

Charles Neely, division manager for the Idaho Power Company at Twin Falls, Idaho, was one of a group of business men from that city who visited San Francisco not long ago.

A. E. Griswold, president, the A. G. Manufacturing Company, Seattle, was among those who attended the convention of the California Association of Electrical Inspectors held recently in San Diego. H. F. Yost, Pacific Coast manager, Trumbull Electric Manufacturing Company, Arthur Kempston, of the Majestic Electric Appliance Company; C. D. Slaughter, of Allied Industries, Inc.; and Grover A. Anderson, of the J. G. Pomeroy Company, all of San Francisco, as well as S. R. Moffat and F. E. Downing, of the Rome Wire Company, New York and Chicago, respectively, were others who were in attendance at the convention.

W. L. Frost, general commercial manager, Southern California Edison Company; H. H. Walker, electrical contractor; P. H. Booth, vice-president, Edison Electrical Appliance Company; and Frank Airey, manager, Pacific States Electric Company, were among the Los Angeles electrical men who sat at the speakers' table at the meeting of the San Francisco Electrical Development League held recently in honor of E. O. Shreve, manager of the industrial department, General Electric Company, Schenectady, N. Y. H. H. Courtright, manager of the Valley Electrical Supply Company, Fresno, also made a special trip to San Francisco to attend the meeting.

O. R. Doerr, manager of the heater and lamp division of the Magnavox Company, Oakland, has returned from an extensive Eastern trip.

V. H. Greisser, chief engineer, The Washington Water Power Company, returned to Spokane from Washington, D. C., a short time ago.

James W. Ryall, one of the organizers of the B. & R. Electrical Supply Company of Denver, has disposed of his interests to return to his former position with the Mine & Smelter Supply Company as manager of the electrical department in Denver. He succeeds A. E. Bacon, who has resigned to become the representative of the National Metal Molding Company in the Mountain territory.

Will H. Fischer, for some time past manager of the greater service department, Southern California Edison Company, has been appointed an assistant vice-president of the Edison company. Mr. Fischer began his career as a newspaper reporter in San Francisco twenty-seven years ago. He was employed in various capacities, as reporter, editorial and feature writer on several papers of that city. He was best known, perhaps, as a reporter of national conventions; he wrote the story of the nomination of Roosevelt, Taft, Harding, who were elected, and of Parker who was defeated. He was



WILL H. FISCHER

for some time editor and manager of the Humboldt Times of Eureka; later an editorial writer on Los Angeles papers. Previous to joining the forces of the Edison company he was engaged in tax research work and was well known as a writer on these and other economic subjects.

Hugh A. Smith, formerly division engineer at Boise for the Idaho Power Company, has resigned to take up a similar line of work with the Longview Public Service Company, Longview, Wash.

Obituary

Frederick Gordon Cartwright, connected with the electrical industry of the West for the past thirty-five years, died in San Francisco April 10. Born in Deep Creek, Va., and educated in Boston, he spent a number of years as construction and electrical engineer with Eastern electric companies. He arrived in San Francisco in 1890 and became assistant general manager of the Electric Improvement Company. He also acted as special agent for the Fort Wayne Electric Corporation, Fort Wayne, Ind., in that capacity laying out and supervising electric and steam plants in many Pacific Coast cities. He held various managerial and engineering positions with early light and power companies in San Francisco. During the latter part of his career he acted as consulting electrical engineer.

TRADE NOTES

Electrical Equipment Company, Butte, Mont., are exclusive distributors for Apex-Rotarex merchandise for Oregon, Washington, northern Idaho and Montana. H. P. Whitten, general manager of the concern, has taken charge of opening direct branches at Portland, Butte and Spokane, in addition to the branches established at Seattle and Tacoma.

W. P. Fuller & Company, San Francisco, has issued a new industrial paint bulletin on the subject of painting light colors over bituminous compounds. The bulletin describes the uses of "Ful-Lumina" paint, especially for covering surfaces which previously have been painted with bitumens.

Roy E. Hanson, Los Angeles, manufacturer of differential recorders, flow indicators, no-flow alarms, orifice plates and Venturi meters, has announced the perfection of the Hansen transformer flow indicator for use in transformer cooling water systems. The new device is made in two sizes, 0 to 12 gal. or 24 gal. and 0 to 15 or 30 gal. The indicator is also applicable for steam, oil or air.

Electric Storage Battery Company, Philadelphia, is furnishing the electric storage batteries for the new S.S. Malolo now under construction for the Matson Navigation Company. She is said to be the largest and fastest high-powered passenger steamship ever built in this country. The launching is expected to take place in the spring.

Erie Malleable Iron Company, Erie, Pa., has issued an 80-page booklet on Kondu fittings. Photographic illustrations and complete price lists are given in the booklet, and the labor and cost-savings features are defined.

Federal Electric Company, Chicago, celebrated its twenty-fifth anniversary in the electrical industry recently. The founders of the business, John F. Gilchrist and James F. Gilchrist, were guests of honor at a dinner given for the directors and members of the firm.

Redwood Manufacturers Company, San Francisco, has issued two new booklets covering its products. Catalog No. 11 is a handbook of information for hydraulic engineers relating to Remco redwood pipe. In addition to dealing with installations and applications of redwood pipe, the book has many valuable hydraulic tables. Catalog No. 21 deals with Remco redwood tanks. It sets forth the principles involved and general instructions for building foundations and setting up redwood tanks.

Wagner Electric Corporation, St. Louis, is furnishing large display cards showing the half-length figure of a boy. A fan in the foreground is connected and trained on the card. Breezes from the fan set the boy's tie fluttering, the motion attracting the attention of the passerby. These cards are being distributed for window displays.

Ludlum Steel Company, Watervliet, N. Y., is building a continuous furnace of modern construction and design for billet heating. In the recuperative equipment is employed Ludlum's own heat and scale-resisting material, as well as its Delhi Tough which is used in tube form in this equipment.

Edwin L. Wiegand Company, Pittsburgh, electrical heating engineers and manufacturers of Chromalox heating units, has announced that W. Hunter Snead, former publicity division manager of the Westinghouse Electric & Manufacturing Company, has become its advertising and sales promotion manager.

The Swartzbaugh Manufacturing Company, Toledo, Ohio, has issued a small folder descriptive of its Everhot electric cooker. Photographs showing the different types with extra equipment and complete price lists are given.

The Brown Instrument Company, Philadelphia, has issued a new 76-page booklet, "Instructions for Installation and Care of Thermo-Electric Pyrometers." The book contains numerous diagrams and photographic illustrations.

Curtis Lighting, Inc., Chicago, has announced a new fixture, known as the X-Ray control ring, No. 13351, which when attached to X-Ray show window floodlight No. 33 or X-Ray projector No. 51, converts the unit into a spotlight.

Electrical Testing Laboratories, New York City, have issued bulletin No. 101 on testing, inspection and research work on impregnated, paper-insulated lead-covered cable.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued circular No. 1670-A, a discussion of power factor, its correction and the selection of corrective equipment, with numerous tables and charts.

Designator Manufacturing Company, 316-420 Sixth Street, San Francisco, is manufacturing an electrical, revolving designator to be used to indicate beauty parlors, as the red and white pole designates barber shops. It is made in two styles, pedestal 81 in. high and 12 in. in diameter, and bracket 45 in. long and 12 in. in diameter, each style showing two feminine heads.

Celite Products Company, Los Angeles, has issued bulletin No. 317, containing specifications covering diatomaceous silica as an admixture in concrete, as well as typical specification clauses covering the use of Celite as an admixture.

General Electric Company, Schenectady, has issued bulletin No. 352 on Capacitors. The bulletin is illustrated with photographs of the capacitor and various methods of installation. Its economies and other advantages are covered thoroughly in the booklet.

The Rix Company, Inc., San Francisco and Los Angeles, is the new name of the Rix Compressed Air & Drill Company, which has been reorganized with an increased capital stock to take care of increased business. The officers of the new company are A. E. Rix, president; Austin Rix, vice-president; M. L. Hewett, secretary and sales manager, and R. W. Arns, director and manager of the Los Angeles branch. The San Francisco office is located at 400 Fourth Street, and in Los Angeles the concern is established at 419 East Third Street.

Pacific Foundry Company, San Francisco, has issued recently bulletin No. 90 on Corrosion, a product developed and produced by the company. The booklet is illustrated with photographs and drawings and contains complete price lists.



What a pity there is no Mack Sennet interested in bathing beauties of the male gender! This is the original cast of those touching verses, "many a flower is born to blush unseen and waste its sweetness on the Pasadena air." For here are no other than some of the notables at a recent sales meeting of Listenwalter & Gough, held in Pasadena. History also goes on to say that some actually took to the water, too, which is more than can be said of Mack Sennet's w.k. "hotsies-totsies."

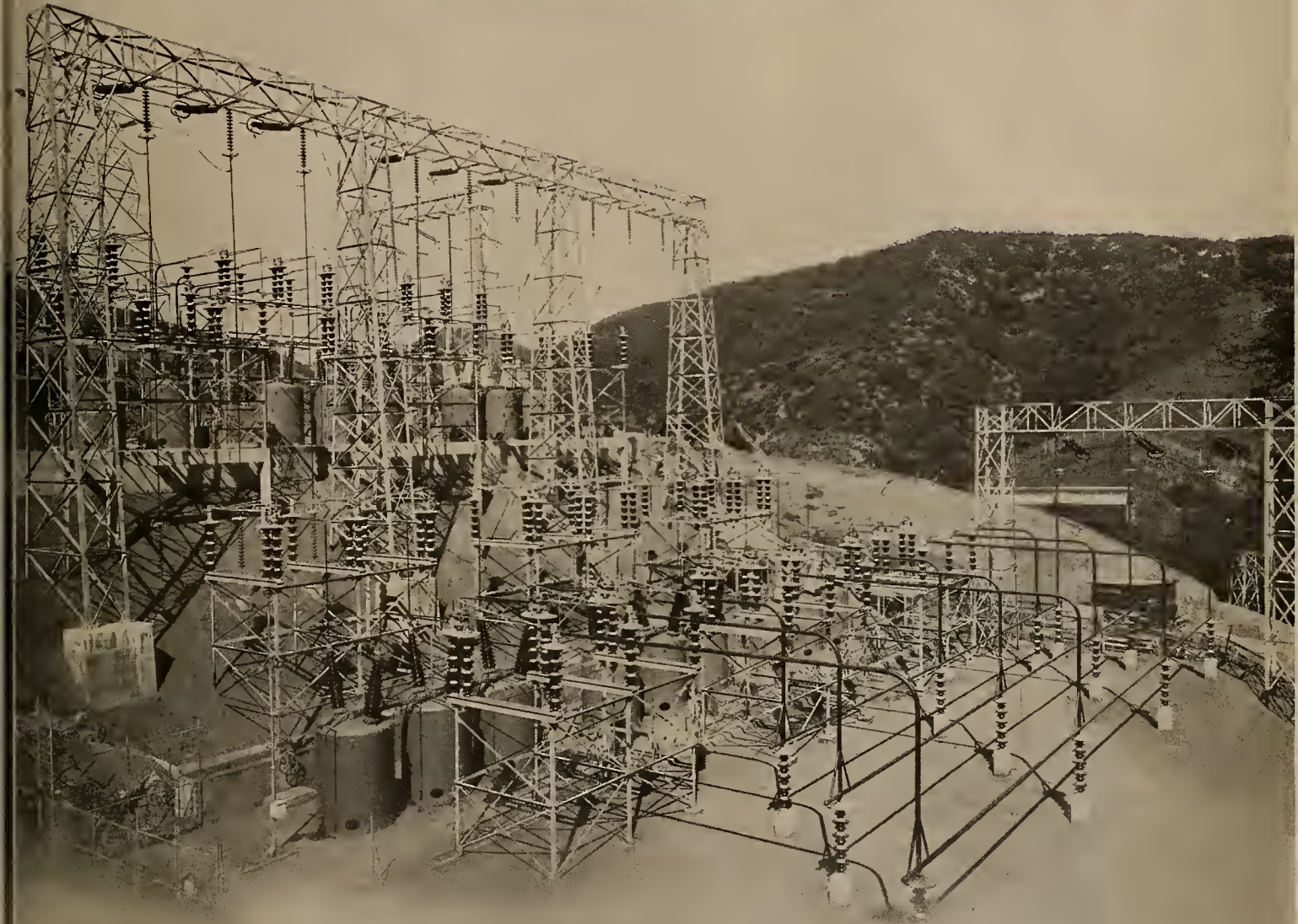
A McGraw-Hill Publication
San Francisco, Calif.

P. C. E. A. Convention Number

May 15, 1926
25 Cents

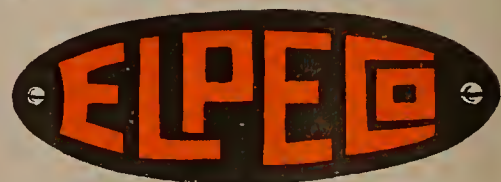
Journal of Electricity

Devoted to the Economic Production and Commercial Application of Electricity
IN THE ELEVEN WESTERN STATES



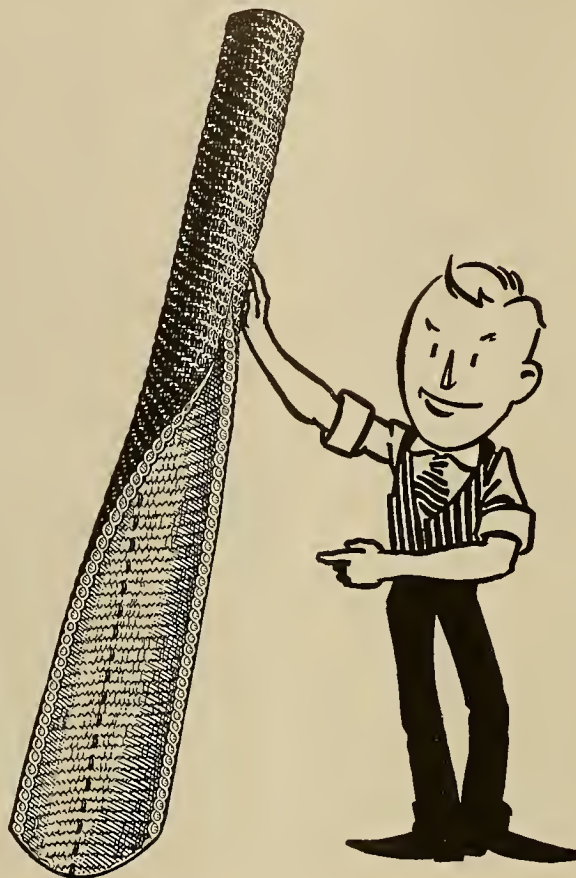
Eagle Rock Substation Southern California Edison
Company equipped with Elpeco two hundred
thousand volt group operated disconnect-
and grounding switches. A total of forty-four
switches were required for Eagle Rock, Crescenta
and Magunden Stations.

For the good of the Service



PHILADELPHIA

C. E. INGALLS, San Francisco
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DURADUCT

Reg. U. S. Pat. Off.

The Fast Fishing Loom

*—with the original Single Wall
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It sure does cut Labor Costs.

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Pacific Coast Representatives

ALLIED INDUSTRIES, INC.

455 Second Street,
San Francisco

305 Ninth Street,
Oakland

1256 Factory Place,
Los Angeles

53 Fourth Street,
Portland

532—1st Ave., South
Seattle

EDITORIAL

Year's Progress Recorded in Committee Reports of P. C. E. A.

COMMITTEE reports to be presented at the tenth annual convention of the Pacific Coast Electrical Association at the Biltmore Hotel, Los Angeles, June 8-11, 1926, comprise the major portion of the editorial section of this issue of the Journal of Electricity.

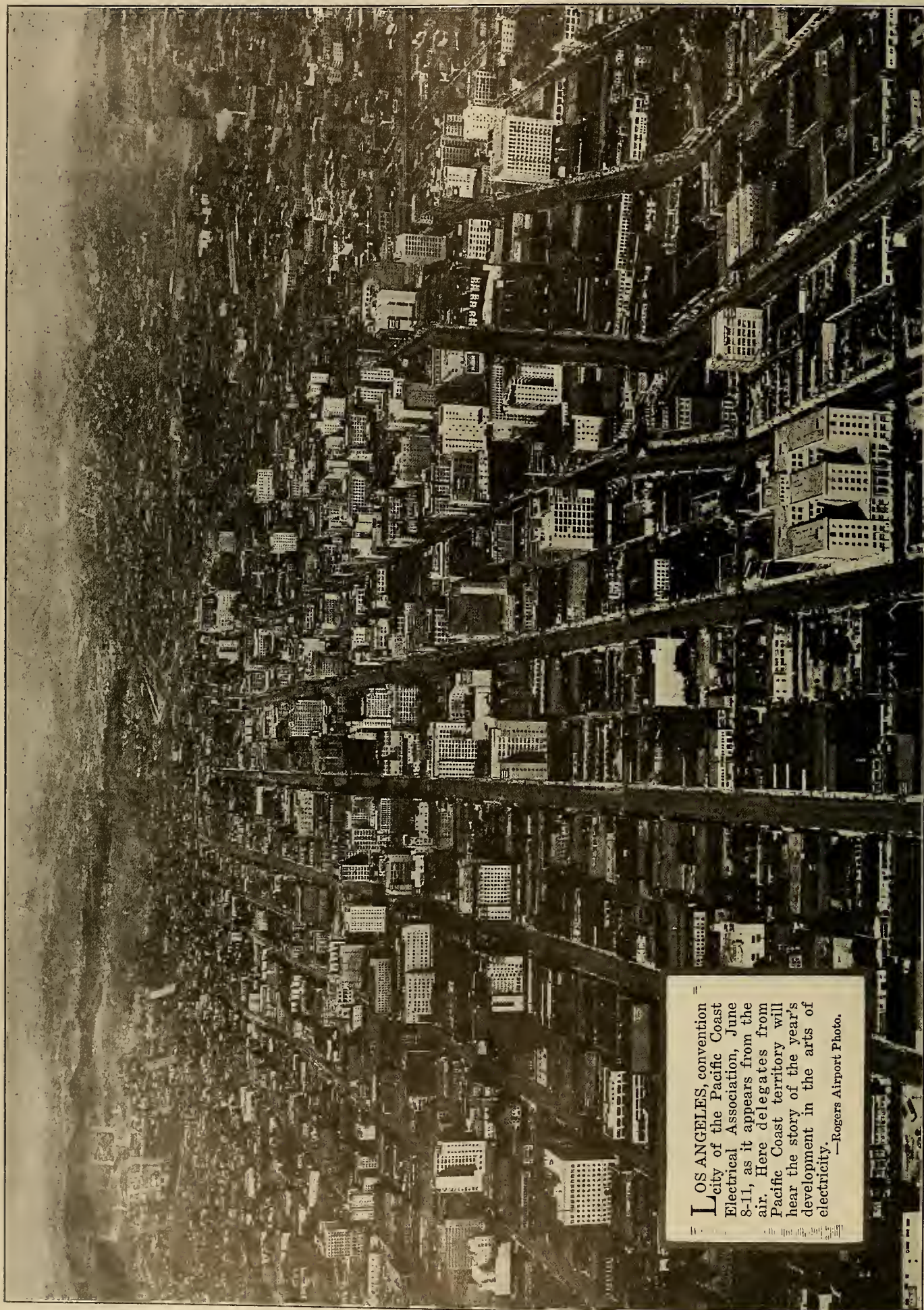
THESE papers cover a wide range of subjects and present an accurate cross-section of the most advanced practices and problems incident to the generation and application of electrical energy to the service of the community. Discussions range from the design of a modern substation or the burning of fuel oil and natural gas under boilers to the application of electricity to heating water or providing refrigeration in the home. They represent the year's work of committees of specialists who have given generously of their time and effort so that all may benefit from the experiences of each individual.

LOGICALLY the discussions center about the central station as the hub of the wheel representing the electrical industry. Nevertheless there is much in the reports which

has a definite bearing upon every branch of applied electricity. Every man in the industry will benefit by a careful perusal of those phases of the reports which bear upon his particular field.

THE practice of publishing the papers prior to the convention has been adopted because it affords an opportunity to all members of the association to study the reports carefully so that they may be prepared to enter fully into the convention discussions. Moreover, it brings the convention to those who are so unfortunate as to be unable to attend. Again, it affords all readers of the Journal an opportunity of participating to this extent in the benefits of membership in the association.

THOSE who have had the privilege of reviewing the papers unanimously agree that they represent the finest effort in the history of the association. It behooves every reader to devote as much time as possible to the study of these reports. Only by so doing will he fit himself to keep pace with the most rapidly progressing industry in the country.



LOS ANGELES, convention city of the Pacific Coast Electrical Association, June 8-11, as it appears from the air. Here delegates from Pacific Coast territory will hear the story of the year's development in the arts of electricity.

—Rogers Airport Photo.

"Each May Draw the Total Sum Without Diminishing the Principal"

By William A. Baurhyte

President, Pacific Coast Electrical Association

WHEN you come to the 1926 convention of the Pacific Coast Electrical Association in Los Angeles in June, be prepared to do two things:

- 1—Give
- 2—Take

It is a mistake if any delegate thinks that because he is not on the program nor on a committee he is not in position to add to the interest or value of the convention. For he is.

The chief value of a convention is in the getting together of the leaders in the industry, where each contributes his enthusiasm, his experience and his friendship to an inexhaustible fund, wherefrom each may draw the total sum without in the slightest diminishing the principal.

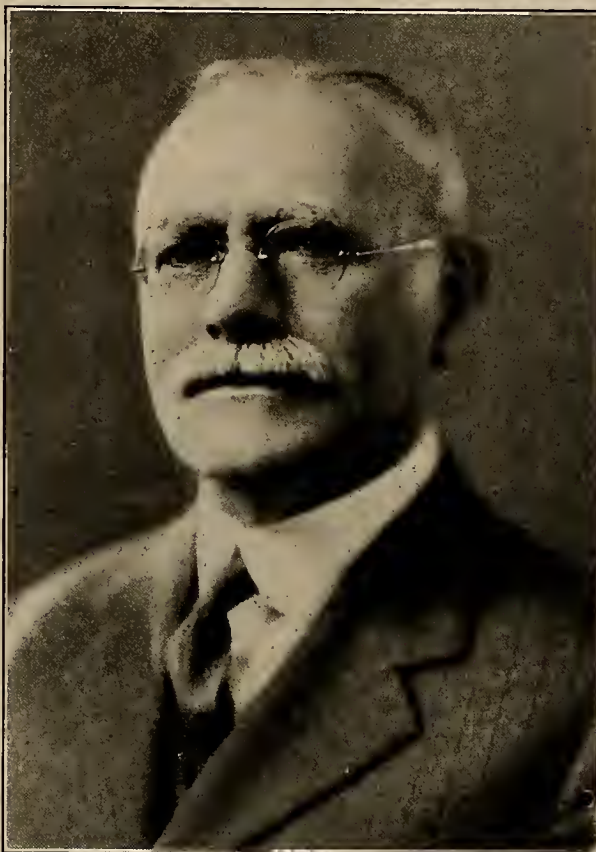
A convention is not like a bank. A bank depositor may withdraw his own, with its accrual, but no more. And no one else may touch it.

A convention is different. Each delegate is gainer to the extent to which he has taken for his own use of the contributions of the others and is richer by just so much as he has given of his own personality and experience to the edification of his fellow delegates.

In other words, a convention is all gains and no losses!

While all these benefits are conferred by any good convention, the forthcoming P.C.E.A. convention on June 7 to 11 will have a special theme in the prosperity of the territory served by the association. The program will carry through the idea of security to investment and business and the constant improvement and extension of electrical service.

The usual study of group problems through the section meetings has been provided for. At the same time care has been taken to see that the various phases of the industry are treated liberally



WILLIAM A. BAURHYTE

in the program for the general sessions so that all who attend the convention may get a fairly complete picture of the electrical situation in the territory of the Pacific Coast Electrical Association.

Special effort has been made to foresee and satisfy the social needs of the gathering, as well as the purely business features. A round of pleasure has been scheduled for the ladies. People who play golf will find that facilities are at hand to satisfy the craving for golfing. Banquet, reception and ball will minister to the happiness of those who like a dash of evening entertainment to season the more serious activities of the convention sessions. In its entirety, it is the desire and earnest endeavor to make this convention a well rounded, sanely balanced meeting of

the people of the electrical industry of this geographic division. There will be no fads, no eccentricities. It will be just a convention. We hope and believe it will be a very good convention and very enjoyable. We plan to sound the note of sanity in business and business relations and in business control and regulation.

Each section of our association has added to the knowledge of our craft by the work it has accomplished during the year. It will be our privilege to hear of these accomplishments and to discuss their significance during the sessions of the convention. The importance of these works to the world we serve as public servants will depend in a measure upon the thought and study we give them.

We urge and invite the executives and leaders of the industry to attend and to see that as far as possible those who would profit from the convention attend also.

And come bearing the gift of your own contribution to the fund of knowledge and good-will so that the harvest may be the greater for us all.

Technical Section Reports

Electrical Apparatus Committee Reports*

Outline of Year's Work

By J. C. GAYLORD

It is impossible at this time to give a complete report of the activities of the apparatus committee as all the studies started have not yet been completed. This, while complete in some respects, will be more of a progress than a final report.

The electrical apparatus committee this year is carrying on the work of keeping in touch with new developments and uses of electrical apparatus, especially as applying to the operating companies of the Pacific Coast. It also is making special studies of the operation of oil circuit breakers in service of relays and relay applications and of Pacific Coast practice in substation design. In conjunction with the overhead systems committee and the safety rules committee the committee is studying fuses, transformer voltages and ratios and electrical grounds. In conjunction with the inductive co-ordination committee it is studying remote supervisory control, especially its application to substations.

At each meeting considerable time also has been given to the discussion of operating experiences. These discussions proved very interesting and instructive.

In addition to the above work, which is carried on within our own territory, the committee is co-operating with the electrical apparatus committee of the N.E.L.A. by gathering data and by answering many questionnaires sent out by subcommittees of the national committee.

Organization

This year the committee has some 60 members representing the member operating companies of the P.C.E.A., the manufacturers and manufacturers' agents. The general organization is on the company-correspondent plan although special committees have been appointed by the chairman for the study of particular subjects. The company-correspondent plan was chosen with the hope that each correspondent might have within his company a small apparatus committee, if you please, to study the general program as it applies to his particular system. In this way the benefits of the work are participated in by the largest

number. This scheme of organization has proved very satisfactory and the interest shown in the meetings has been enthusiastic. The personnel of the committee is shown in the accompanying list.

Meetings and Program

A total of three double meetings have been held this year; in Los Angeles on Sept. 24 and 25, 1925, at which there was an attendance of about 65; in San Francisco on Jan. 14 and 15, 1926, at which the attendance was about the same; and in Fresno April 8 and 9, 1925, with an attendance of about 70.

One of the sessions of the Los Angeles meeting was devoted to illustrated talks on substation design as practiced by the Pacific Gas and Electric Company, the Southern California Edison Company, and the San Diego Consolidated Gas and Electric Company.

The first talk was given by S. J. Lisberger of the Pacific Gas and Electric Company in which he described the designs used by his company for city and for rural substations. H. L. Sampson and G. A. Fleming described a small standard distribution substation and a typical transmission substation as designed by the engineers of the Southern California Edison Company. K. B. Ayres described a noiseless downtown station built by the San Diego Consolidated Gas & Electric Company. All three papers brought forth much discussion.

At the San Francisco meeting the substation designs submitted by different operating companies were discussed. A preliminary report of the subcommittee on oil circuit breakers presented by R. C. Denny of the San Joaquin Light & Power Corporation also aroused interest and discussion.

C. E. Schnell of the San Joaquin Light & Power Corporation presented a paper, illustrated with lantern slides, entitled Some Notes on Substation Design as practiced by his company. L. A. Buese of the Los Angeles Gas & Electric Corporation presented an illustrated talk on the East Side substation of that company. Both papers were very interesting and brought forth considerable discussion.

R. R. Cowles, chairman of the Technical Section, P.C.E.A., who represented our apparatus committee at the Detroit meeting of the national apparatus committee gave a short report of that meeting and presented an illustrated paper on the Wallenpaupek 220-kv. power project of the Pennsylvania Power & Light Company, which had been presented at the Detroit meeting. This paper was discussed by Walter Dreyer and E. A. Crellin of the Pacific Gas and Electric Company and proved very interesting.

A joint session also was held with the overhead systems committee and the safety rules committee for the discussion of the preliminary reports of the subcommittee on fuses, on transformer voltages and ratios, and of the subcommittee on electrical grounds.

Committee Reports

Relays and relay applications, oil circuit breakers, electrical grounds, and a series of reports on substation design on the Pacific Coast will be found on the following pages. These reports represent the work completed, or brought to a state of partial completion warranting a report, within the past administrative year.

Fuses and transformer voltages and ratios, and remote supervisory control are covered in joint committee reports submitted respectively under the overhead systems committee and the inductive co-ordination committee. The chairmen of these joint committees were appointed from these two major committees, thus the reports appear accordingly.

* J. C. Gaylord, Southern California Edison Company, chairman; H. A. Laidlaw, Pacific Gas and Electric Company, vice-chairman. Allis-Chalmers Company: F. H. Searight, California Oregon Power Company: S. M. Bullis, R. M. Daniels, H. A. Fraser. C. E. Ingals, Inc.: C. E. Ingals. Coast Counties Gas & Electric Company: W. R. Van Bokkelen. Coast Valleys Gas & Electric Company: G. A. Peers, T. W. Snell. Delta-Star Electric Company: W. W. Kirk. Garland-Affolter Engineering Company: P. H. Affolter, G. E. Armstrong, A. E. Garland. General Electric Company: M. S. Barnes, J. H. Cunningham, H. E. Fuqua, W. E. Melarkey, M. H. Schnapp, W. C. Smith, J. S. Spurck, H. C. Stanley, E. E. Valk, Great Western Power Company: C. F. Benham, R. P. Crippen, G. K. Morrison, A. Scott. Los Angeles Bureau Power & Light: M. O. Bolser, H. H. Cox, C. H. Jenkins, O. Wingard. Los Angeles Gas & Electric Corporation: F. E. Dellinger, C. B. Judson, F. R. Knight, G. A. Riley. Ontario Power Company: A. J. Hall. Pacific Electric Manufacturing Company: J. C. Clark. Pacific Gas and Electric Company: E. A. Crellin, B. D. Dexter, R. B. Kellogg, H. A. Laidlaw, H. S. Lane, S. J. Lisberger, H. T. Sutcliffe, J. O. Tobey, Roy Wilkins. San Diego Consolidated Gas & Electric Company: K. B. Ayres, A. S. Glasgow, D. J. Kelly, E. D. Sherwin, C. W. Wiggins. Southern California Edison Company: L. H. Beebe, L. L. Dyer, G. A. Fleming, D. J. Kenneley, C. C. Long, H. L. Sampson, E. R. Stauffacher, F. H. Mayer. City of San Francisco: P. J. Ost. San Joaquin Light & Power Corporation: R. C. Denny, H. N. Kalb, H. H. Minor, L. J. Moore, C. E. Schnell. The Southern Sierras Power Company: R. H. Halpenny, J. N. Keith, D. K. Lawson, P. H. Yelton. Westinghouse Electric & Manufacturing Company: J. E. Brown, A. W. Copley, W. F. Grimes, R. A. Hopkins, W. P. L'Hommiedien, R. C. Stackhouse, W. L. Winter. H. B. Squires Company: S. P. Russell.

Addenda: Great Western Power Company: G. H. Hager. Los Angeles Gas & Electric Corporation: L. A. Buese. Southern California Telephone Company: G. R. Nott.

Program for 1925-1926

At the Los Angeles meeting the following program for the year's work received final approval. Following its adoption there was considerable discussion of the subjects therein.

- 1. Pacific Coast practice in transmission and distribution substations; this should be the major topic.
- 2. Tests of station grounds; further information on this subject is very desirable.
- 3. Oil circuit breakers:
 - (a) Report of any tests which may be conducted by Pacific Coast companies.
 - (b) Gather data and study oil circuit breaker operation by a special committee in conjunction with the member companies in the use of form adopted by the Apparatus Bureau at Fresno meeting, 1925.
- 4. Review of transformer voltages in conjunction with the overhead systems committee.
- 5. Relays and relay application:
 - (a) New types of relays for the protection of transmission networks.
 - (b) New types of relays for the protection of internal trouble in equipment.
 - (c) New or unusual application of older types of relays.
- 6. Lightning arresters.
- 7. High-tension fuses.

Pacific Coast Practices in Transmission and Distribution Substation Design*

Palm Springs Substation, The Southern Sierras Power Company; 15/2.3-kv. Distribution

By P. H. YELTON

This substation was built to take care of increased load at Palm Springs, a rapidly growing desert winter resort. The old 2-pole 75-kva. substation is continued in operation to carry increased load south and east of the town. The outdoor structure is of the standard pipe-frame construction frequently used for distribution substations. The station is unattended; the local agent reads meters and gives what other attention is required. Eventually the local agent's office and dwelling will be located on the substation lot.

I. 15 kv.

(a) Frame work and general layout: The frame work is of 1½-in. galvanized iron pipe construction, each panel diagonally braced with ¼-in. galvanized steel strand. One bay is provided for each trans-

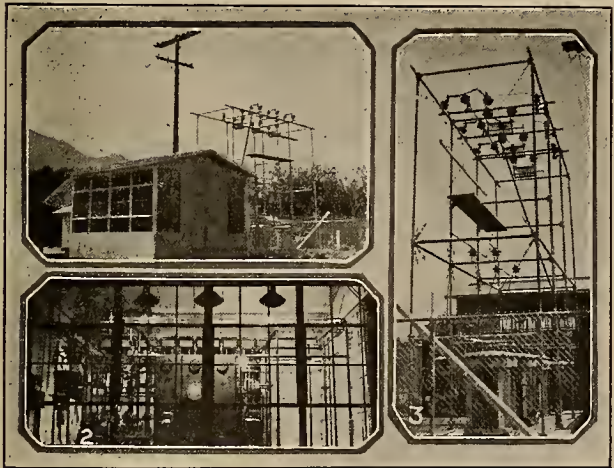


Fig. 1. (1) Showing station building, transformer rack, and two outgoing 2.3-kv. circuits. (2) Night view through windows of station. (3) Close-up of transformer rack.

former and provision is made in the design of the ultimate layout for two incoming 15-kv. circuits. Lines are carried to the structure with a slack span from the dead-end pole at the corner of the lot.

Only one 15-kv. circuit is brought into the substation at this time and it may be noted from Fig. 1 that the arrangement shown in Fig. 2 was not followed exactly. It was thought better to bring the

*General report, Electrical Apparatus Committee; comprising information gathered from various member companies.

one circuit into the structure in a symmetrical manner; also by this arrangement the necessity for a bus was avoided at this time.

(b) Transformers—Three 100-kva., single-phase, 15/2.4-kv., self-cooled, Westinghouse type SK.

(c) Air-break switch—Three-pole, 27-kv., 100-amp. air-break switch assembled by S. S. P. Company.

Disconnect switches—Fused disconnect switches, S. S. P. Company design.

(d) Electrical protection—Westinghouse 17-kv., auto-valve lightning arresters are connected on the sta-

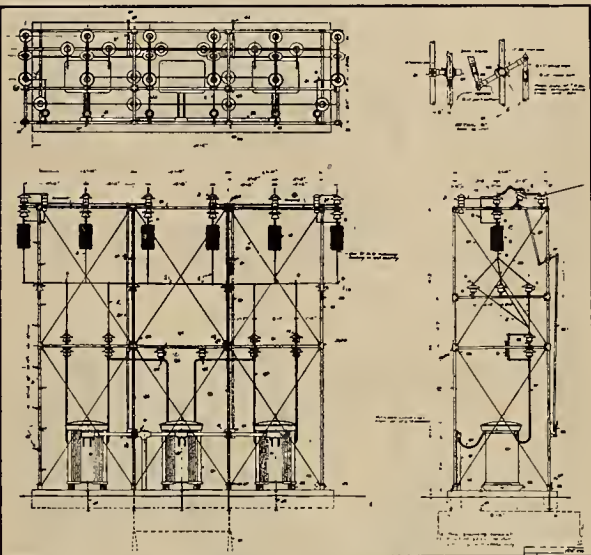


Fig. 2. Details of transformer rack.

tion side of the air-break switches. Pacific Electric 17-kv., 30-amp. fuses are used in the transformer disconnect switches.

II. 2,200 Volt

(a) Frame work and general layout—The 2,300-volt construction is located indoors and is mounted on 1½-in. pipe framework.

(b) Induction regulators—Two single-phase, 23-kva., G.E. type I.R.S. regulators with 10 per cent regulation are connected in the transformer mains to

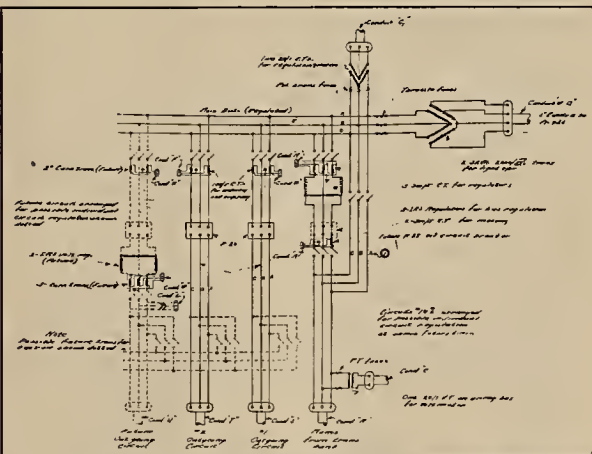


Fig. 3. Three-line wiring diagram; all dotted lines indicate future equipment.

the bus, providing regulation for the entire station. Provision is made for possible future installation of regulators on all feeder circuits.

(c) Switching equipment—The two outgoing 2.3-kv. feeders each are equipped with a 400-amp., 7.5-kv. Westinghouse type F-22, hand-operated, remote-control, oil circuit breaker. Provision is made for a future oil circuit breaker on the 2.3-kv. mains from the transformer.

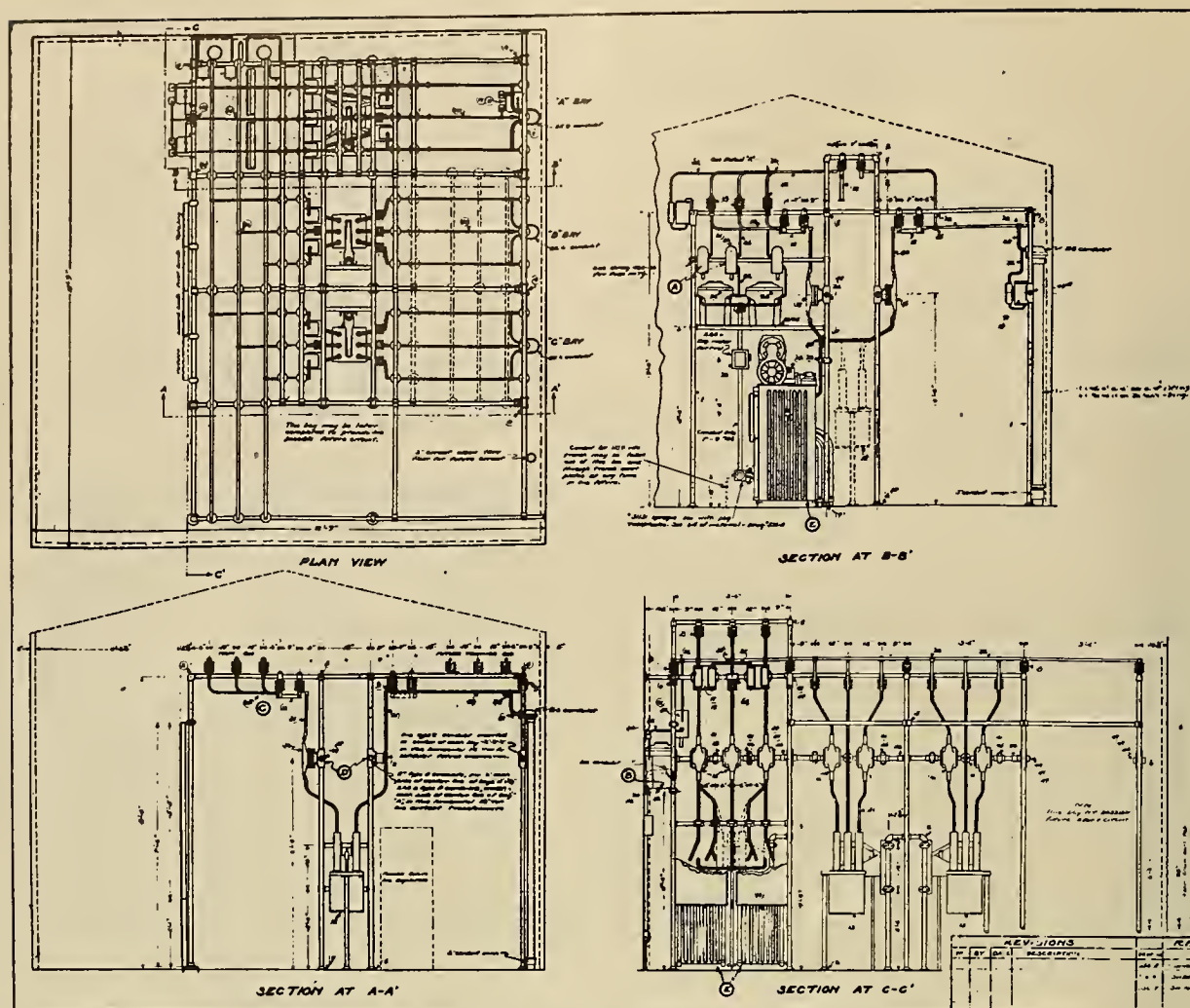


Fig. 4. General arrangements of equipment within the station.

(d) Electrical protection—The 2,300-volt circuit breakers are equipped with inverse time limit trip coils. Provision has been made for installing overload relays if found desirable in the future. There are no lightning arresters on the outgoing feeders.

(e) Switchboard and metering—Three black marine slate panels 16x65x2 in. in dimension with three 16x25x2-in. sub panels are used for the 2.3-kv. circuits. These are placed together with space for a future panel. One totaling panel is provided for the 2.3-kv. mains from the transformer and provision is made for placing an oil switch on this panel as mentioned above. Two panels are provided for the two 2.3-kv. feeders and the plans provide for the addition of a third feeder panel when needed.

A watt-hour meter is provided on the totaling panel, indicating ammeters on each panel, and a Bristol recording voltmeter on the regulator bus. A bracket indicating voltmeter with a voltmeter switch makes it possible to read voltage on one phase of the unregulated bus and each of the phases of the regulated bus.

Station service—Two 3-kva. 2,200/220-110-volt transformers connected open delta are provided for station service, lighting and induction-regulator motors. These are protected by Line Material Co. P46C5 throttle fuses rated 4.4 kv. with 3-amp. fuses.

(g) Lines—All 2.3-kv. circuits are 6.6-kv. varnished-cambric, single-conductor cable run from the building in underground iron conduit to the first pole from the station.

(h) Building—The substation building is steel angle frame construction about 16x16x12 ft. in dimension, with concrete floor and foundation. The sides are covered with No. 16 gage and the roof with No. 24 gage galvanized sheet steel. Steel window

sash was used freely in the construction of the building to improve the appearance and to increase the lighting. A certain advertising effect is gained also in the appearance of the building at night as shown in Fig. 2.

(i) Miscellaneous electrical equipment—Each set of 15-kv. lightning arresters is connected by No. 1/0 stranded bare copper wire run down the pipe frame to two Paragon ground cones interconnected with the same size conductor. Two other separate cones are provided, one for grounding the transformer cases and 15-kv. pipe frame work and one for grounding the building, conduits and 2.3-kv. frame work in the building.

The transformers and 15-kv. bus structure are surrounded by a 7-ft. steel chain-link fence. The ultimate design provides for the erection of a building and landscaping so that the grounds will be in keeping with the development of the surrounding neighborhood.

Coronado Substation, San Diego Consolidated Gas & Electric Company; 2.3-kv. Distribution

By K. B. AYRES

This is a distribution substation for switching and regulating purposes only, fed at the same voltage which is distributed from it. The station is located across San Diego bay from the generating stations and is fed by two submarine cables each approximately 3,600 ft. long laid across the narrow point in the bay and operated in parallel.

Supplying these cables is a feeder direct from Station A, with an emergency connection through pole-type, non-automatic oil circuit breakers so that either or both may be supplied from either the Coronado



Fig. 1. General view of the Coronado substation.

feeder or from the emergency. The substation ends of the cables are brought to the same panel, each equipped with an oil circuit breaker. All equipment is indoors and all circuits to and from the station are run underground to cable poles.

Switchboard panels are of natural black slate, the panel and subbase being 72 in. high. Disconnecting switches are mounted on separate panels above the main board, with the bottom hinge 8 ft. above the floor.

The bus is split with bus disconnects so that the regulator is connected between the incoming feeders and the distribution mains. Oil circuit breakers so arranged and interlocked that an instantaneous change from regulated to unregulated service can be made. The station light and power, and series street-lighting circuits are fed from the unregulated end of the bus and all the distribution mains from the regulated end. Station light and power is furnished by a very small open-delta transformer bank, as the requirements are very light.

Oil circuit breakers are 4.5 kv., type K-5, with a capacity of 200 amp. They are manually operated and equipped with automatic trip. There is one 2.3-kv., 3-phase, 250-amp. regulator installed. Feeder characteristics are very similar so that separate regulation is not required.

Street lighting service is supplied by one 60-kw., type RV constant-current transformer controlled on the primary side by a 2.3 kv. time switch. The alarm system is connected to a klaxon horn outside the

station in the court so that it is readily heard any place on the property and in the operator's house.

The substation building is of brick, stuccoed. The architecture of both the substation and the operator's home is Mission style with a wall inclosing the yard and extending between the station and the house forming a court. On the rear of the lot is a double garage with a work shop and a storage room.

As there is no subway system near this station the cables are carried in ducts running directly to the cable poles from a cable trough or pit back of the switchboard.

This station serves the whole of the city of Coronado, with a population of 4,000 inhabitants, and the Army and Navy aviation fields with their quarters and shops on North Island.

Alta Vista Substation, San Joaquin Light & Power Corporation; 11/2.3 kv. Station

By C. E. SCHNELL and E. K. SADLER

This substation is one of three 11/2.3-kv. zone substations on an 11-kv. loop circuit in the city of Fresno. Both ends of the 11-kv. loop come from the California Avenue substation. A large part of the city of Fresno is served by 2.3-kv. distribution lines and it was to take care of growing needs of the city that these zone substations were built. At each of the zone substations are two line switches, one for each side of the loop, protected by directional relays so that trouble

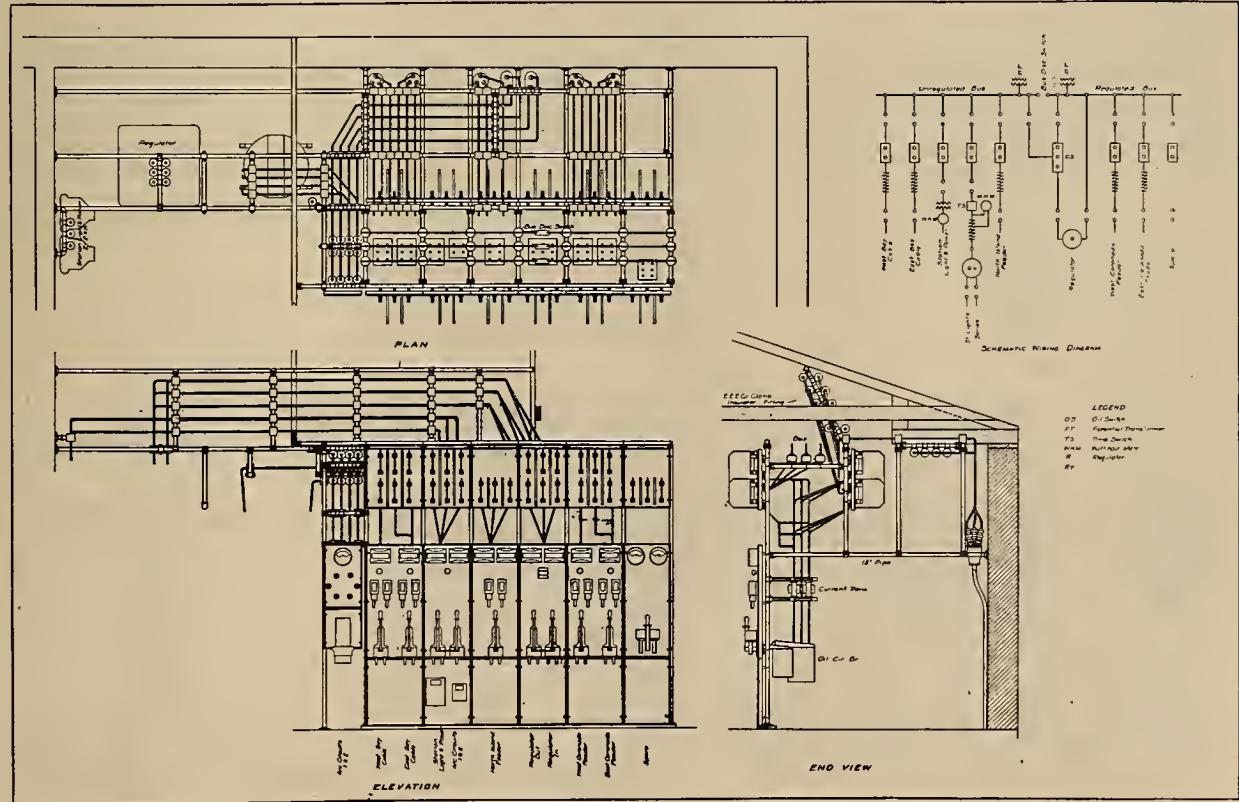


Fig. 2. Schematic wiring diagram, Coronado substation.

at one point on the 11-kv. loop will not interrupt service to the substations. There are four feeder switches installed and spare locations for four more.

At Alta Vista the 11-kv. and 2.3-kv. structures were built as a unit; the 11-kv. switches being on one end and the 2.3-kv. on the other end of a single pipe rack. The whole layout is outdoors except for the relays

switches provide for the bypassing of any circuit breaker. All buses are of copper tubing supported on outdoor-type bus supports. Two potential transformers hung on one end of the rack furnish potential for the CR relays. No metering is done at the zone substations.

(b) Transformers—There are three Moloney self-cooled transformers of 500-kva. capacity. Their full voltage rating is: primary, 12.5 kv., with full capacity taps; and secondary, 2.3 kv.

(c) Switches—The three circuit breakers are Kelman F-6, 6-break, 400-amp., 15-kv., manually operated and are equipped with bushing-type current transformers.

All disconnect switches are Pacific Electric 300-amp., 1,500-volt, underslung. They are mounted at about 30 deg. with the vertical for ease of operation.

(d) Electrical protection—CR directional and CO overload relays protect the line switches and CO overload relays also protect the transformer switch.

(e) Switchboard and metering—The protective relays are mounted on an ebony asbestos panel inside a small house. On the panel is also a blocking switch for each set of relays.

Distribution

(a) General layout—The 2.3-kv. rack is a unit with the 11-kv. rack. The 11-kv. bus extends the full length of the structure. The transformers are connected to the bus through disconnecting switches. A 2.3-kv. transformer bus runs over the top of the induction regulators. Two single-phase induction regulators are connected between the transformer bus and the main, or regulated 2.3-kv. bus. Disconnecting switches provide ample means for bypassing the regulators. Pole-top type automatic oil circuit breakers are used for feeder switches. These are connected to the main 2.3-kv. bus through disconnect switches. Handles for the manual operation of the feeder switches are grouped at each end of the 2.3-kv. structure. Switch operating mechanisms are connected to these handles by means of galvanized wire ropes.

(b) Induction regulators—There are two single-phase G.E. outdoor-type 2.3-kv., 69-kva. induction regulators installed for regulating the main 2.3-kv. bus.

(c) Switching equipment—All feeder switches are Kelman type 10-UA, 300-amp., 15-kv. automatic. All disconnect switches are Pacific Electric, underslung, 300- and 600-amp., 15-kv. Series trip equipment protects all feeder switches.

(d) Station service—A 5-kva. transformer hung on the 11-kv. end of the rack and connected through primary cutouts furnishes lighting service for the station. Two 3-kva. transformers connected through primary cutouts to the 2.3-kv. transformer bus supply power for the induction regulator motors, while two 3-kva. transformers connected to the 2.3-kv. main, or

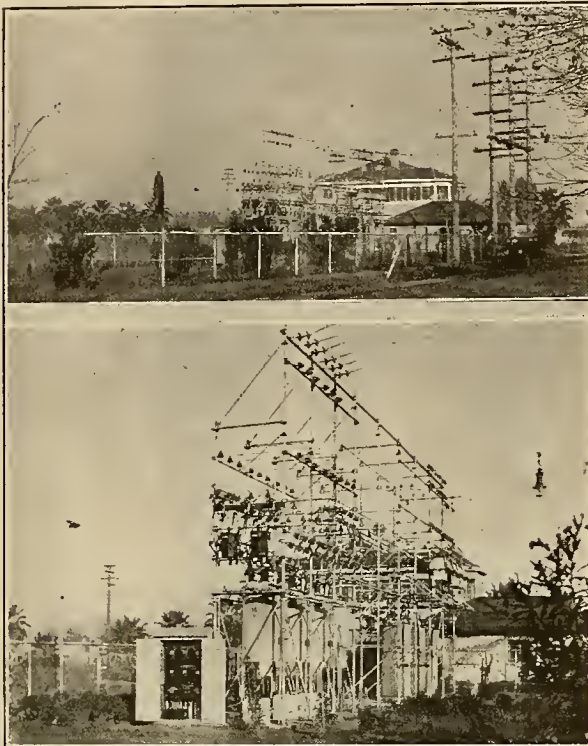


Fig. 1. General view of Alta Vista "zone" substation (above) and a close-up of the pipe bus structure and the relay house (below).

and storage battery which are in a small building. The installed capacity of the station is 1,500 kva. One spare transformer is provided for each two of this type of stations. There is no operator employed at the zone substations.

Transmission

(a) Framework and general layout—The 11-kv. switches, air and oil, are mounted on a rack built of galvanized iron pipe. There are three circuit breakers hung from the rack, two of which are line switches and the other a transformer switch. Disconnect

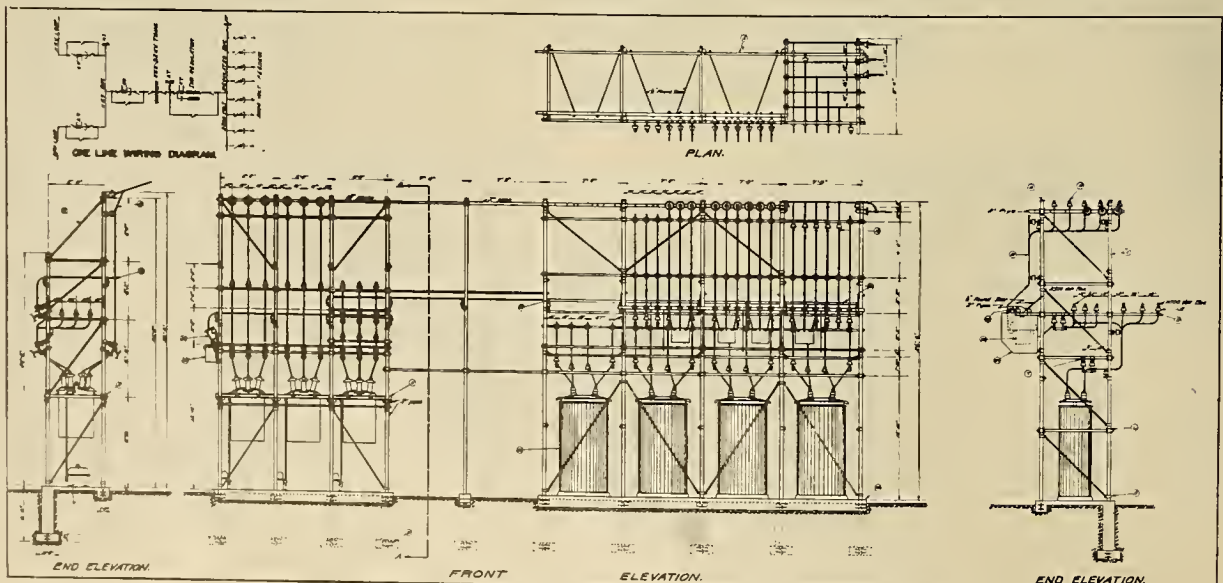


Fig. 2. Details of bus and switch structure, Alta Vista substation.

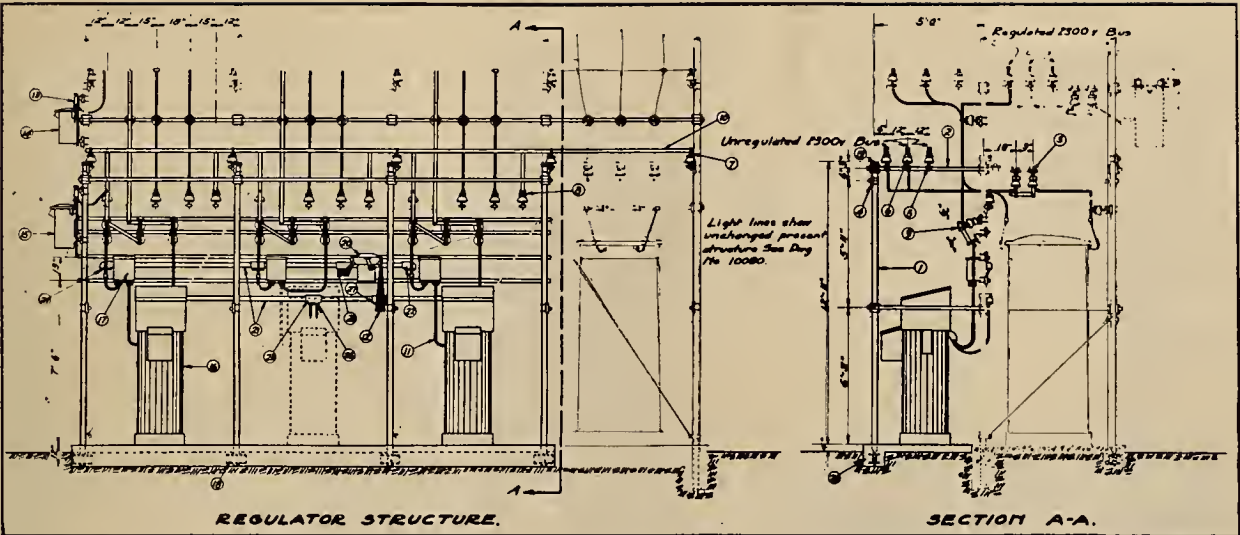


Fig. 3. Induction-regulator bus, Alta Vista substation. This is located adjacent to the transformer bus as may be seen in Fig. 1.

regulated, bus supply potential for the contact-making voltmeters on the regulators.

Miscellaneous

- (a) Substation—The only building is a small 3x5x7-ft. wood frame corrugated iron house for the relay panel and storage battery.
- (b) Battery and charger—A 12-volt, 80-amp.-hr. storage battery supplies power for tripping the 11-kv. switches. There is no charger, the battery being changed as needed.
- (c) Ground system—A 12-in. bore was put down 14 ft. for a ground well. A No. 3/0 wire with a copper plate attached was lowered to the bottom of the hole and the well then filled with charcoal and salt. One line of the 2.3-kv. delta bus is connected to the ground wire. All switch tanks, transformer tanks, regulator cases, and steel structures also are connected by No. 3/0 wires to the ground system.
- (d) Lighting system—Outdoor reflectors mounted on pipe standards illuminate the switch structure.
- (e) Conduit and underground system—All current leads, trip wires, and potential leads are in conduit placed underground.
- (f) Water supply—The water supply is obtained from the city mains.
- (g) Station premises—The whole yard is graded and walks are graveled. A 7-ft. Cyclone fence with barbed wire on top encloses the substation site. The portion of the substation yard that is not taken up by the pipe rack, building and walks is laid off in lawns and flower beds.

Le Grand Substation, San Joaquin Light & Power Corporation; 110/70/11 kv.

By C. E. SCHNELL and E. K. SADLER

This substation is of the outdoor-type of construction now practically standard for stations of this class. It is located on the 110-kv. line as originally built between Kerckhoff power house and Merced. The con-

struction of the Exchequer power house of the Merced Irrigation District resulted in the Le Grand substation being chosen as the point of delivery of this power into the San Joaquin system; the entire output from the Exchequer power house is under contract to be delivered to the San Joaquin system.

There are three 110-kv. lines: Kerckhoff, Exchequer and Merced; a bank of four 5,000-kv. auto transformers, 110/70-11 kv.; one 70-kv. line to the Dairyland substation and the 70-kv. system beyond; and four 11-kv. feeders serving the local territory. All oil switches are remotely controlled from the switchboard by a 12-volt d.c. control circuit and are operated by compressed air.

Two operators are employed at this station, one or the other being on shift at all times. The company has constructed a cottage and garage for each. Both cottages are equipped with electric range, water heater and numerous convenience outlets.

Transmission

- (a) Steel towers and buses—Galvanized steel towers support the buses which are No. 3/0 bare stranded copper. Where possible it has been the practice of this company to use individual towers with buses supported between, giving a much more open switch yard than is possible where a continuous steel structure type of construction is used. A transfer or auxiliary bus making it possible to tie any of the 110-kv. lines together for line-switch inspection or other maintenance work, is a very desirable feature of this layout.
- (b) Transformers—There are four 5,000-kva., G.E. air-cooled auto transformers, connected Y on the high voltage side with auto-transformer connection and auxiliary connection. The tertiary is connected delta. The auxiliary winding is rated at 2,500 kva. Full winding voltages are as follows:

High voltage.....	63.5/110 kv., Y
Auto transformer connection.....	44.8/79.4 kv., Y
Auxiliary	7.2/12.5 kv., Y
Tertiary	6.6 kv.

Nominal transmission voltages are 110 kv. and 70 kv. Distribution voltage is 11 kv.



Fig. 1. General view of the Le Grand substation of the San Joaquin Light & Power Corporation.

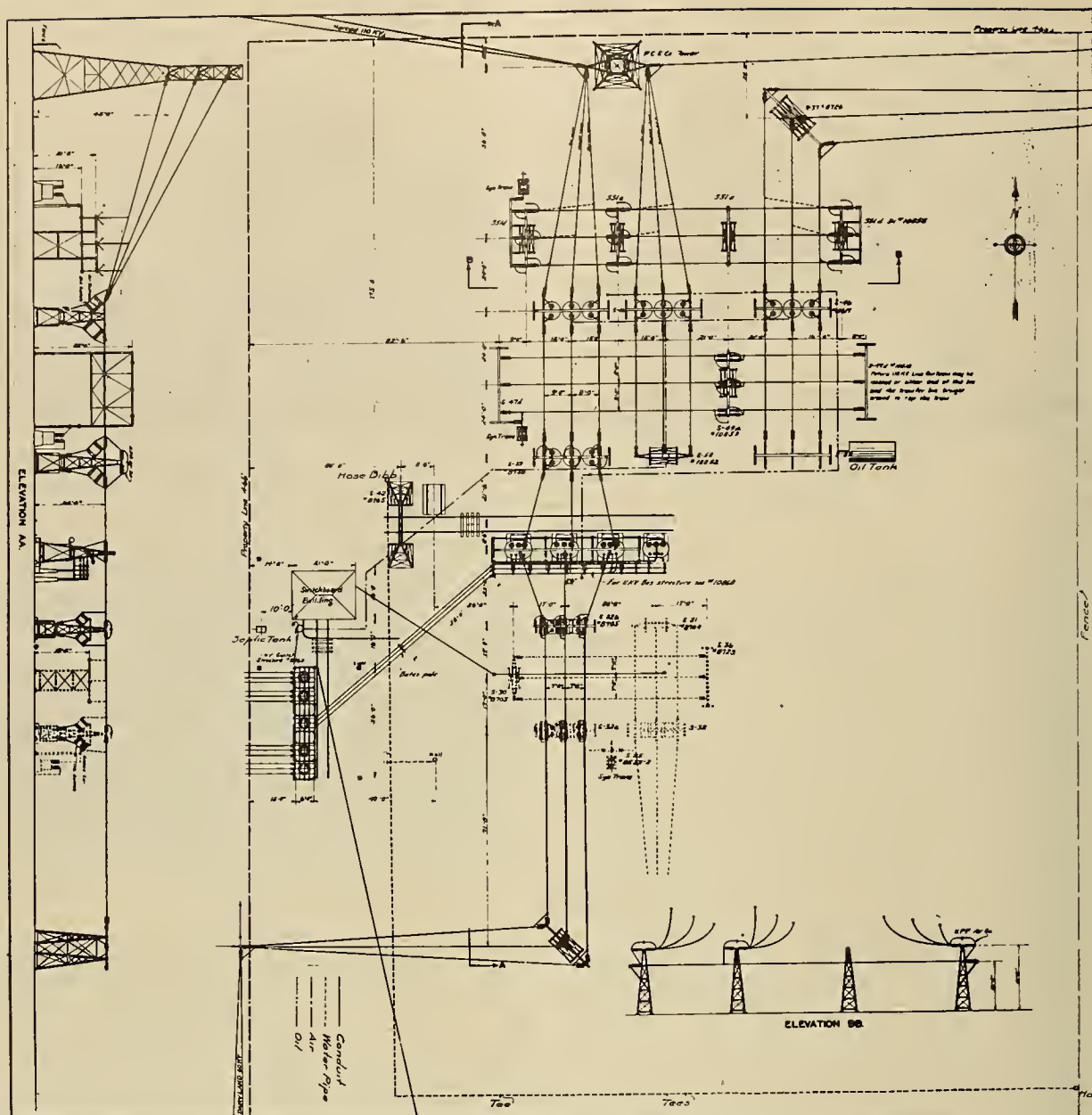


Fig. 2. Yard layout at Le Grand substation.

(c) Circuit breakers, pole top switches, disconnecting switches—All 110-kv. circuit breakers are Kelman, 4-break, round-tank, air-operated. The 60-kv. oil circuit breaker also is Kelman, 60-kv., 4-break, air-operated. All high-tension air-switches are K.P.F. type and the high-tension disconnect and ground switches are of S.J.L.&P. manufacture. Disconnect switches operate separately and ground switches operate in gangs.

(d) Electrical protection—CR-directional and overload relays are used on all line switches: CV voltage relays also are used. CO relays differentially connected protect the transformer bank.

(e) Switchboard and metering—The switchboard is made up of ebony asbestos panels and arranged with remote-control push and pull-button switches, with indicating lamps, for all circuit breakers. The switchboard is installed in the station building as a unit with the low tension board. Ammeters with 3-phase ammeter switches are installed for each line and for each 110 and 70-kv. transformer position. Current for these is obtained from bushing-type transformers in the circuit breaker tanks. Ammeters were calibrated on job. Potential and synchronizing receptacles and plugs are installed on the switchboard along with a swinging bracket carrying the synchroscope and two voltmeters. Potential of any incoming line can be measured at any time.

Distribution

(a) General layout—The feeder rack is outdoor-type, built of galvanized pipe and supports all buses, switching and metering equipment for the master switch and four feeder switches. The oil switches are mounted on trucks with a transfer track running the length of the rack and into the substation building where a pit is provided to allow lowering of the switch tanks to obtain access to the switch mechanism. The outdoor rack carries a main bus and a transfer bus. All circuits are provided with disconnect switches to allow the bypassing of any circuit breaker or the connection of any line to the transfer bus.

(b) Switching equipment—Oil circuit breakers are Kelman type F-6, 400-amp., 15-kv., truck-mounted and air operated. Disconnecting-type terminal boxes are provided for all current and control leads, which allows removal of a circuit breaker without disconnecting any wires except the main 11-kv. tubing from the bushings on top of the switch itself. All disconnecting switches are mounted at an angle of 30 deg. with vertical to provide easy operation. They are separately operated.

(c) Electrical protection—The master switch is protected by three CO overload relays Y-connected to 3 bushing-type current transformers. All feeder switches are protected by two CO relays Z-connected to 3 bushing-type current transformers.

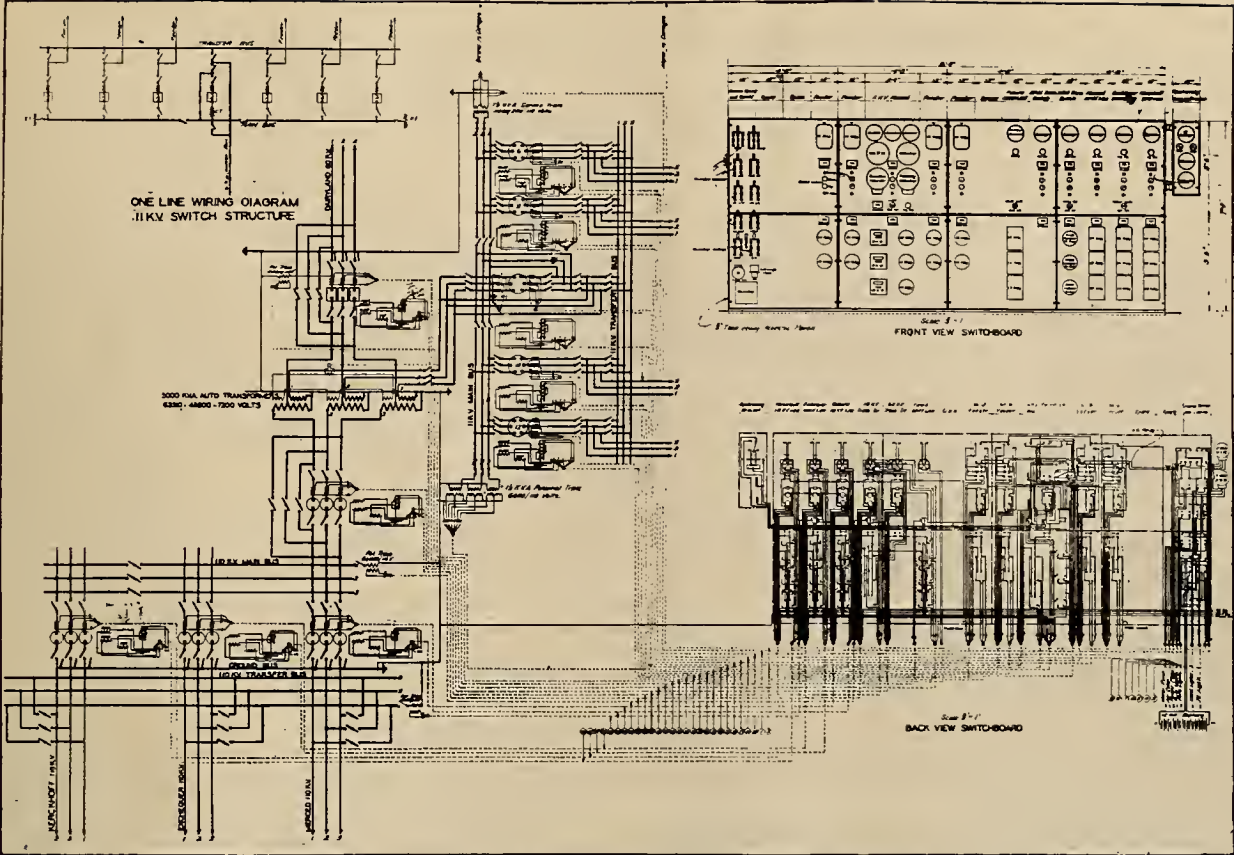


Fig. 3. General wiring diagrams for the Le Grand substation.

(d) Switchboard and metering—The switchboard is inside a brick building the exterior of which is cement-plaster finished.

Buildings

(a) Substation—The only building in the substation proper is the one which houses the switchboard, battery, telephone and other such equipment. This building is of red brick covered inside and out with cement plaster. The roof is finished with red crushed brick. Windows are steel sash. Outside dimensions of the building are 16x21 ft.

(b) Auxiliary buildings—The pump, a hydro-pneumatic type, motor-driven and equipped with an automatic pressure switch is housed in a pump pit and roofed over a short way above the ground level. A large pressure tank is mounted horizontally near the pump pit. This tank is covered with a roof finished with red crushed brick.

(c) Operators' cottages and garages—There are two operators' cottages and two garages, constructed of wood on a concrete foundation. Exteriors are finished with redwood siding and shingled roofs; cottages are plaster finished within. Both cottages are equipped with electric ranges, water heaters and air heaters.

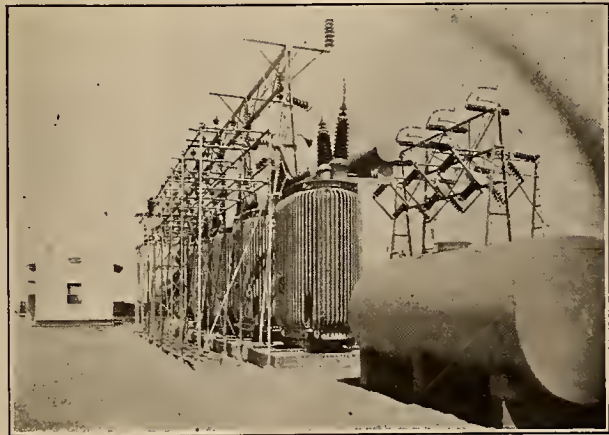


Fig. 4. Auto-transformers, transformer bus, oil-storage tank, and substation building, Le Grand substation.

Miscellaneous Electrical Equipment
(a) Battery and charger—A 12-volt, 80-amp-hr. storage battery supplies power for tripping all circuit

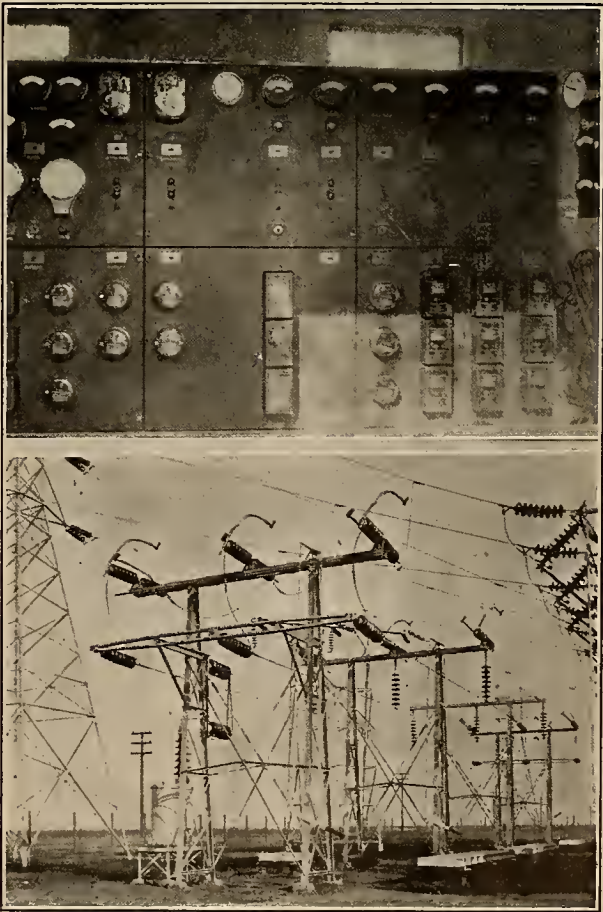


Fig. 5. Switchboard (above) and 110-kv. transfer bus (below), Le Grand substation.

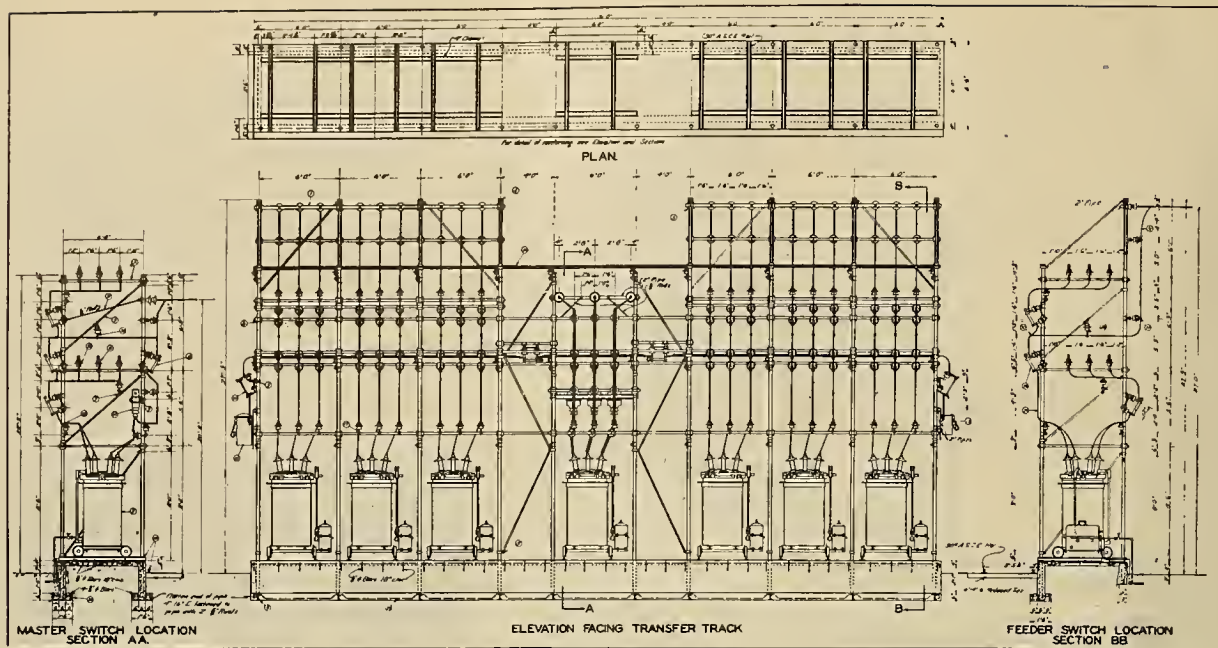


Fig. 6. 11-kv. outdoor switch structure, Le Grand substation. See Fig. 3 for wiring diagram of 11-kv. bus.

breakers, lighting indicating lamps, and operating air valves on switch closing mechanisms. A Tungar charger furnishes a continuous trickle charge to the battery.

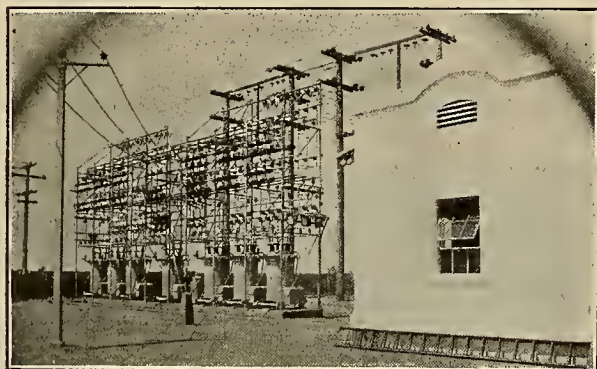


Fig. 7. 11-kv. switch structure; station building at the right, Le Grand substation.

(b) Telephones—A telephone is installed in the substation building; there are no phones in the cottages. An auxiliary gong for the phone is mounted on one of the steel poles in the switch yard.

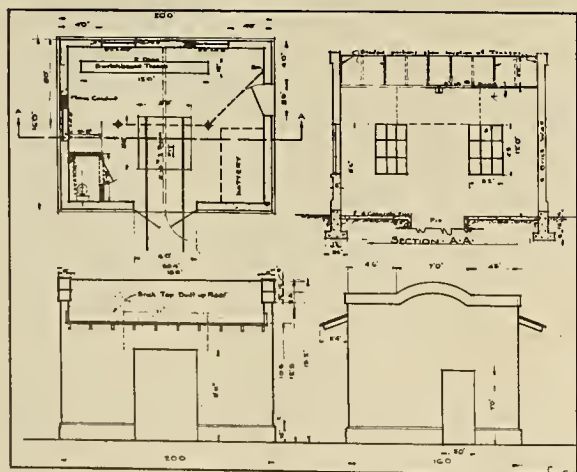


Fig. 8. General details of the station building, arranged to house only the switchboard, meters, battery and such equipment, Le Grand substation.

(c) Ground system—Two ground wells were put down at opposite ends of the switch yard. Each well was 12-in. bore and 20 ft. deep. A 2-in. galvanized pipe was driven down another foot, which brought the bottom of it 3 ft. below the water surface. The holes then were filled with fine sand and gravel. Ground lead of No. 3/0 stranded copper wire run to all steel structures, ground switches, transformer neutrals, oil switch tanks and transformer cases. Connection was made between ground wire and steel frames by means of bolts and heavy brass and copper lugs. The whole ground system was tied together and to the ground-well pipes.

(d) Alarm system—The tripping of all high-tension circuit breakers and the 11-kv. master switch energizes a 12-volt, d.c. alarm bus and sounds the alarm



Fig. 9. Cottages and garages, Le Grand substation.

gong. The locking out of the SS relays on the feeder switches also rings the alarm.

(e) Lighting—The switch yard is lighted by outdoor-type reflector units mounted at accessible points on structures and on pipe standards. All control wires, current leads, potential leads, light wires and station power wires were run underground in galvanized conduit. All conduits also are connected to the ground system.

Miscellaneous Mechanical and Structural Equipment

(a) Water supply—The water supply is obtained from a well in the substation yard.

(b) Oil storage and filtering system—An oil storage tank of 3,750-gal. capacity is located in the switch yard. This tank provides enough capacity to allow the draining of any oil switch or transformer at the substation. Oil lines of 1½-in. pipe are run to positions near all switches and transformers to allow the connection of hoses from the oil pump and filter. The

oil pump and filter are portable equipment, not kept at the substation permanently.

(c) Air system—A motor-driven single-stage air compressor with automatic pressure switch maintains a pressure of 120 lb. in all air lines and in two pressure tanks, one located near the 11-kv. circuit breakers and the other located centrally with respect to the high-tension circuit breakers. The air compressor is installed in the substation building. Connections from the air compressor to the pressure tanks are of 1-in. pipe. Lines to the 11-kv. switches from the pressure tanks also are 1-in. while from pressure tank to the high-tension switches are 1½ and 2-in. lines.

(d) Miscellaneous—The ground around the substation yard and cottages was graded and leveled, and walks and driveways covered with gravel. Seven-ft. wire fence on wood posts encloses the property.

There are three septic tanks installed at the substation. One each to take care of the sewage disposal from the substation building and from each operator's cottage.

In the substation building there are two 1-qt. Pyrene extinguishers. In each operator's cottage there are two 3-gal. extinguishers. In one of the operator's garages is located one 3-gal. extinguisher.

Henrietta Substation, San Joaquin Light & Power Corporation; 70 kv. and 11 kv.

By C. E. SCHNELL and E. K. SADLER

Henrietta substation, located on the west side of the San Joaquin Valley, is one of the older stations on the San Joaquin system. It is an important 70-kv. switching station and also has considerable load on the 11-kv. distribution lines which furnish power for irrigation pumping. Transformers and part of the high-tension switching equipment as well as all 11-kv. circuit breakers were inside of a steel-frame hy-rib building, until the first part of 1925. Part of the high-tension equipment was on wood-pole structures outdoors. The 70-kv. oil circuit breakers were of too small capacity and had blown up on several oc-

casions. The 70/11-kv. transformer capacity was too small and the wood-pole outdoor construction obsolete so the station was rebuilt in 1925.

A new outdoor switch yard was constructed using all-steel galvanized structures which are standard with this company. Switch, dead ends, transfer bus towers, etc., all are separate units spaced so as to give good clearance for all buses. There are 5 70-kv. lines at the substations, Kearney, Corcoran, Tulare Lake, and Coast, the latter being a tie with the Midland Counties Public Service Corporation. The Coast line is metered at 70 kv. at this station. The new 70-kv. bus is of No. 3/0 stranded copper. A transfer or auxiliary bus runs in front of all the line switches allowing the tying together of any lines outside of the main bus. This transfer bus also provides a means for bypassing the line switches for inspection and repair. The main bus is provided with an air sectionalizing switch. Two potential transformers, one on the main bus and one on the transfer bus, are provided for synchronizing. An 11-kv. transfer rack built of galvanized pipe was constructed outside the substation building. New 11-kv. feeder switches were installed inside the building. Only one operator is employed at this substation.

Transmission

(a) Framework and general layout—The high-tension switch yard is of the open type outdoor construction now standard with this company. Separate galvanized steel structures are spaced so as to give good clearance and to support all buses, air switches, ground switch and disconnect switches. Transformers are mounted on concrete blocks under the 70-kv. transformer bus. All high-tension oil switches are mounted on separate framework under the switch towers and the layout is such that all circuit breakers can be bypassed to allow inspection and repair work.

(b) Transformers—General Electric 1,500-kva., self cooled; full-winding voltage rating; primary voltage, 40.1/69.5 kv. Y with full capacity taps; secondary voltage 7/12.1 kv. Y with full capacity taps; tertiary

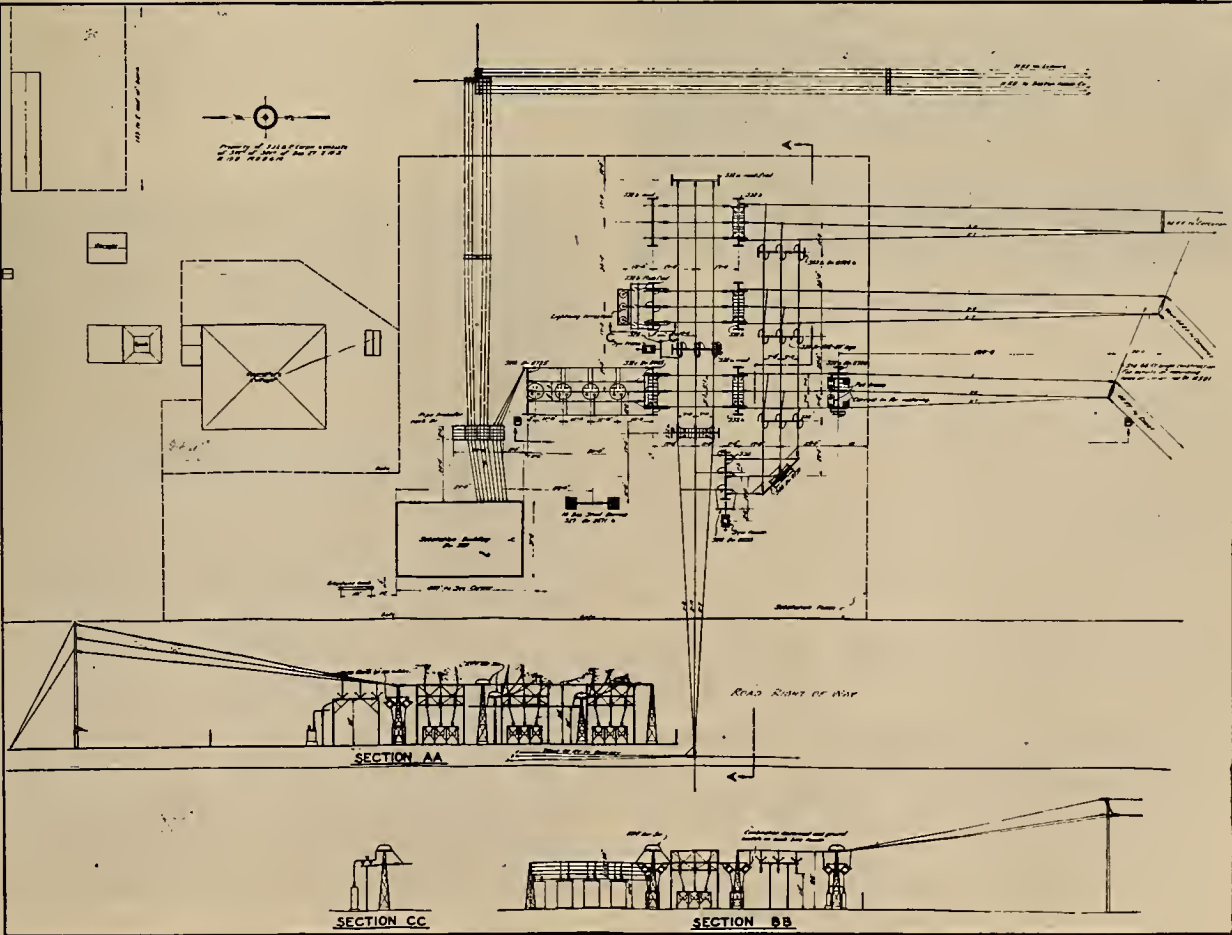


Fig. 1. Yard arrangements, Henrietta substation.

(300 kva) 2.3 kv. Nominal transmission voltage is 70 kv.

(c) Switches—The four 60-kv. line circuit breakers and the 60-kv. transformer switch are Kelman 60-kv., 300-amp., 4-break oil circuit breakers, manually operated. All air switches are K.P.F., all ground and disconnect switches are of S.J.L. & P. manufacture. Disconnect switches are underslung and mounted at 45 deg. with post-type insulators. The ground switches are unit with the disconnect switches, being mounted on the same channel base.

(d) Electrical protection—All the line switches and the transformer switch are automatic. CR directional and overload relays protect all line switches; protection for the transformer switch is series trip.

(e) Switchboard and metering—All protecting re-

voltmeter with voltmeter switch, recording voltmeter, three ammeters and three single-phase watt-hour cutouts.

(e) Station service—Power and lights for station use are obtained from a 5-kva. transformer con-

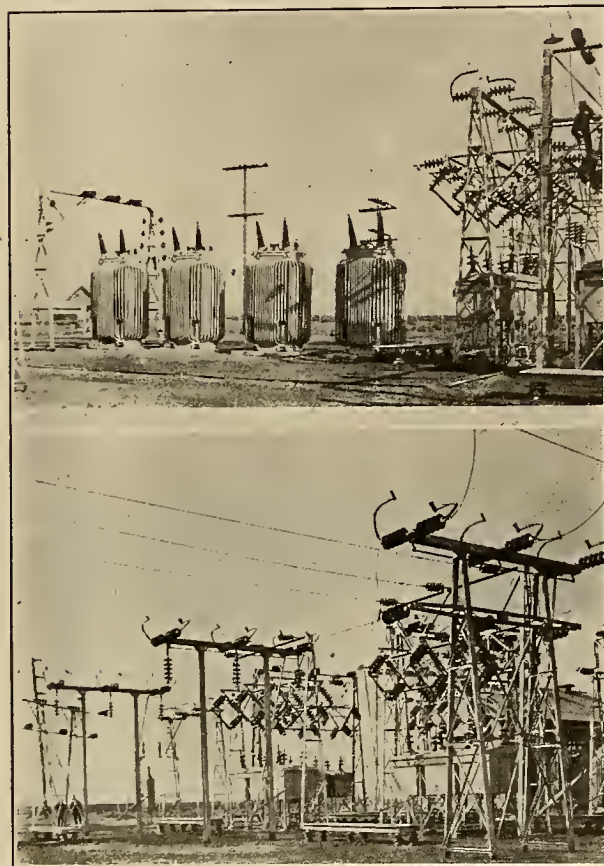


Fig. 2. 70/11-kv. transformer bank (above) and 70-kv. transfer bus (below), Henrietta substation.

lays are mounted on a switchboard inside the substation building. Potential and current transformers are mounted under a steel tower on the Coast 70-kv. line for metering the Midland Counties load from this point. The metering instruments are on a panel inside the substation building and consist of 2 ratchet polyphase watt-hour meters, one indicating wattmeter, one graphic center-zero wattmeter and two ammeters.

Distribution

(a) General layout—The distribution voltage at the station is maintained around 12 kv. There are two feeder lines from the station with a spare switch installed for a third feeder. Master switch and feeder switches are inside the substation building. A transfer rack outside the building provides for the bypassing of any of the circuit breakers. This rack is of galvanized iron pipe construction.

(b) Switching equipment—The master switch is a G.E. K-12 oil circuit breaker and is non-automatic; feeder switches are Condit D-18, 300-amp., 15 kv. and are automatic.

(c) Electrical protection—Feeder switches are protected by series trip operated from current transformers.

(d) Switchboard and metering—The 11-kv. metering equipment consists of an indicating wattmeter,

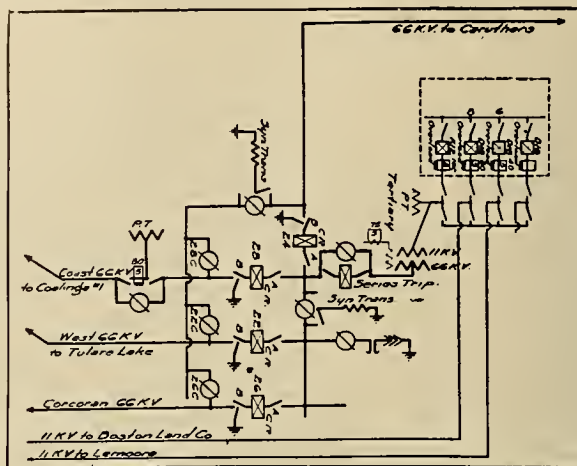


Fig. 3. Schematic wiring diagram, Henrietta substation.

ected to the 11-kv. transfer bus through primary cutouts.

Buildings

(a) Substation—The substation building has a steel frame with hy-rib covering. Its floor dimensions are 31x51 ft.

(b) Cottage—The operator's cottage, garage and barn are of good frame construction.

Miscellaneous Electrical Construction

(a) Battery and charger—A 12-volt, 80-amp. battery supplies power for tripping the circuit breakers and for ringing the alarm bell. The battery is kept on continuous trickle charge.

(b) Telephones—Several phone lines run into this substation. A double bus panel, standard with this company, with double-throw switches provides switching convenience for the station phone.

(c) Ground system—Two ground wells 5 ft. square and 15 ft. deep were sunk one at each end of the transformer bus. Two-inch galvanized iron pipes, 20

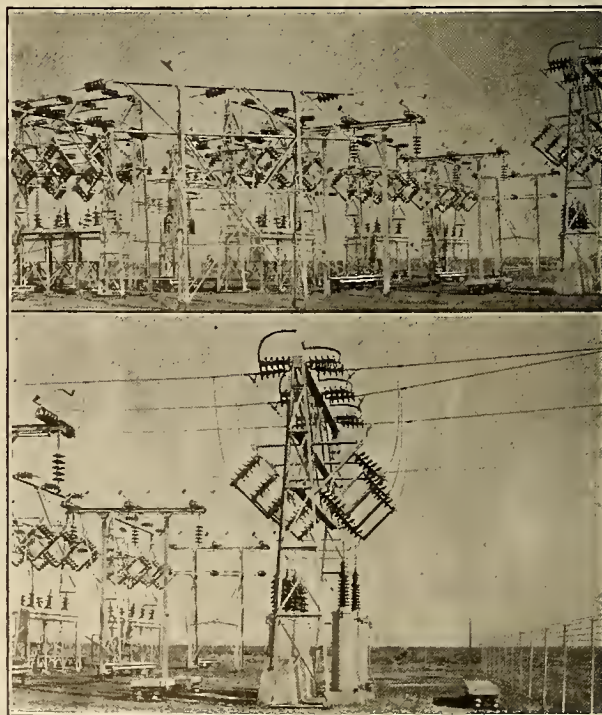


Fig. 4. Line switches, transfer bus and 70-kv. metering structure, at the extreme right (above); close-up of the 70-kv. metering structure (below).

ft. in length were driven in each corner of each well. The bottom of the wells are in moist earth. A copper mat at the bottom of each well connects the pipes. The wells are filled with charcoal and salt. Ground leads of No. 3/0 stranded copper are connected to the ground pipes and run to all transformer neutrals, steel structures, ground switches, oil-switch frames and transformer cases. This new ground system also was tied to the old one in use before the station was rebuilt. The exact condition of this old ground is not known.

(d) Alarm system—Pallet switches on all circuit breakers and an undervoltage relay are connected to an alarm bus energized by the 12-volt storage battery. A 12-volt gong is used for the alarm bell.

(e) Lighting system—The yard is illuminated by outdoor-type reflectors mounted on pipe standards and on the steel structures at accessible places.

(f) Conduit and underground system—All control and metering wires are run underground in conduit as well as station light and power wires.

Miscellaneous General Features

(a) Water supply—When the old substation was built a 90-ft. well was drilled but the water was unfit for use. Hence all water used at the substation has to be hauled in from a point about 5 miles distant.

(b) Miscellaneous—Very little grading and leveling was done as the substation site is on flat ground which was once a lake bed. A 7-ft. Elwood fence on steel posts with barbed wire on top was constructed around the switch yard and substation building. A cess pool 40 ft. deep takes care of sewage disposal.

There are two 3-gal. chemical extinguishers in the cottage while at the substation there are four 1-qt. extinguishers.

Distribution Substations of the Pacific Gas and Electric Company

By SUBCOMMITTEE ON DISTRIBUTION SUBSTATIONS*

Station J, San Francisco—11/4 kv.

Station J is a new substation at Commercial and Leidesdorff Streets, San Francisco, built to replace old station J which was inadequate and offered no chance of growth or expansion.

The new station is a steel and concrete building consisting of a basement and five operating floors. It is equipped with an automatic passenger and freight elevator, intercommunicating telephone system for speed and convenience in construction and operation, and a crane having an electrical lift and manual travel. The structure is supported on piles driven to hard pan and as the basement floor is below high tide level a water-proofing membrane being embedded in the basement floor and walls. To eliminate noise and vibration the machine foundations are isolated from the main floor, felt strips being installed between adjacent building walls with the regulators installed upon 1½-in. cork pads.

On account of the lack of space in the crowded business district the substation occupies the entire lot which is L-shaped, 55x120x85x61 ft. The 11-kv. bus structure is installed on the fourth and fifth floors. Although this scheme introduced certain complications in bringing away the 11-kv. cables, these were more than over-balanced by the short control-conduit runs to the switchboard immediately below.

Electrical Equipment

A double-bus structure of reinforced concrete; 500-amp., 15-kv., 3-pole, single-throw type H-203 oil switches; disconnects each side of the oil circuit breakers, and current and potential transformers in separate concrete compartments filled with wood and transite doors comprise the scheme of arrangement.

Incoming circuits are 11-kv., 3-conductor lead cable of 500,000 circ.-mil size, 3-phase delta, and equipped with ammeters and reverse-power relays. Machine and transformer-bank circuits are 11-kv. and equipped

with watt-hour meters, ammeters and overload induction relays. No reactors are provided for.

Transformer bank—Four 2,500-kva., 11/4 kv. OIWC transformers with 2½ and 5 per cent taps on the high-tension side. Three transformers compose a bank, with one spare equipped with transfer switches and bus so that the spare may be cut into service under load and without service interruption.

Four-kv. bus—A double-bus structure with reinforced-concrete division walls, angle-iron and transite cells, wood and transite doors serves the low-tension. R 13, 1,500-amp., 15-kv., 3-pole, single-throw; and K132B, 400-amp., 15-kv., 3-pole, single-throw oil circuit breakers with disconnecting switches on the line side furnish flexible line control. Current and potential transformers are arranged in groups in separate compartments. Distribution feeders are 4/0, 3-phase-Y with grounded neutral.

Regulators—Automatic 200-amp. induction regu-



Fig. 1. Double-bus 11-kv. switch gallery, Station J.

lators, 10 per cent boost or buck, are installed on each feeder and mounted directly underneath the 4-kv. bus cells. Auxiliaries are mounted on panels on each regulator. Oil circuit breaker controls, automatic-reclosing relays, and instruments are mounted at each regulator bay thus eliminating long conduit runs across the station and up to the switchboard room. One white and one red indicating lamp are installed at the main switchboard to give the operator indication of the position of each feeder. With feeders out of service no lamp indication shows. With feeders in service a red-lamp indication shows. When feeders are locked out by the reclosing relay the white lamp shows. With this arrangement the operator at a glance can tell the feeders out of service; the feeders in service; the particular feeders in trouble and consequently locked out.

A hand-reset, grounding-protective relay is installed on each bank of regulators that will lock the feeder out and give an alarm only in the event of a regulator failure. Sheet-metal oil dams of sufficient height to hold all of the oil contained in one regulator are installed to confine the burning oil in case of a tank failure. These dams are easily removable without the use of tools so that a regulator may be removed and another installed in the least possible time. No current-limiting reactors have been provided for.

Exit to the street manholes is by way of the basement through 4-in. fiber ducts embedded in concrete. The 11-kv., 4-kv. and 250-volt cables each are in separate duct lines.

Rotating machinery—Three 9,000-amp., 230-290-volt d.c., booster-type synchronous converters constitute the present installation, with space for three additional units. These machines supply the 125-250-volt d.c. Edison 3-wire system in the downtown district. The converter transformers are located in the basement directly underneath the a.c. end of each machine thus insuring the shortest possible low-voltage a.c. leads. This arrangement eliminates the trouble often encountered due to the strong field induced by the heavy alternating currents. This layout allows a very con-

* R. B. Kellogg, chairman; S. J. Lisberger, E. A. Crellin, B. D. Dexter, H. T. Sutcliffe; all of the Pacific Gas and Electric Company.

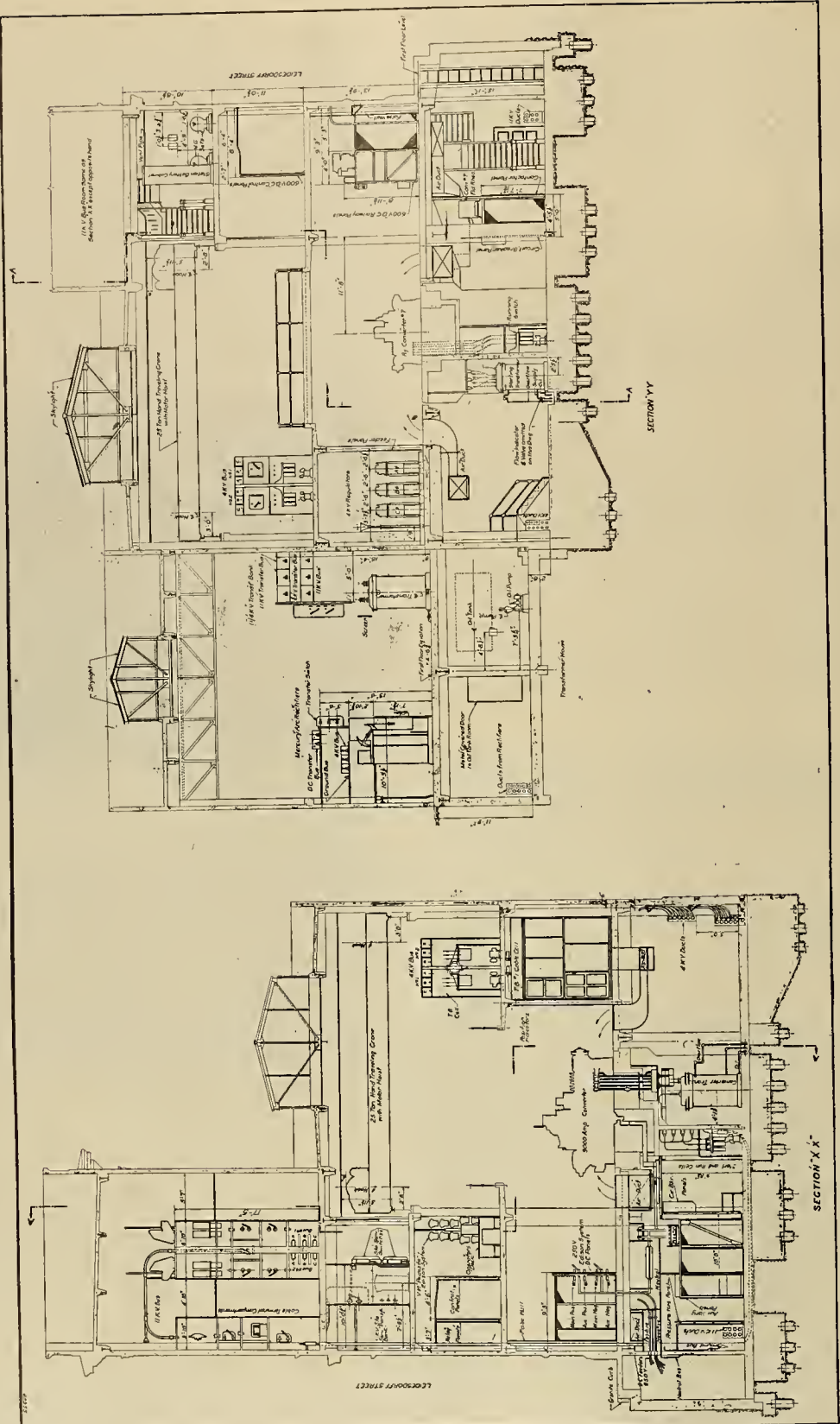


Fig. 2. Sections through the station at the two different points showing the general arrangement of equipment, Station J.

venient and economical location for the start and run oil circuit breakers which also are in the basement directly in back of the 3-phase transformer. The start and run switches are connected in the high-tension side of the transformer.

The d.c. leads are 6 leaves of 1/4x6-in. bus copper, from the machine terminals to the d.c. switchboard. The a.c. low-voltage leads are 3 leaves 1/2x4-in. copper, from the transformer terminals to the a.c. rings. The 11-kv. leads are 4/0 varnished cambric, double

flame-proof braid in the start and run cells and 4/0 3-conductor paper-insulated, lead-covered cable from the bus switches to the start and run switches.

Converters are rated 9,000-amp., 260-volt d.c. with 15 per cent buck or boost. Transformers are rated 2,820 kva., 11.5 kv. high-tension delta to 190 volts low-tension diametrical 3-phase and 6-phase. They are water cooled, type WCTH.

Both transformer and converter are capable of 100 per cent overload for a short time and are arranged

for star-delta starting. They also are arranged to restore the Edison system, in case of a complete shut-down, by first picking up the load on the star connection at a reduced voltage (full buck) then transferring one converter at a time from Y to delta connection and adjusting the buck and boost voltages to properly parallel the machine. When all converters have been transferred to the delta or running position the voltage is raised gradually to normal conditions.

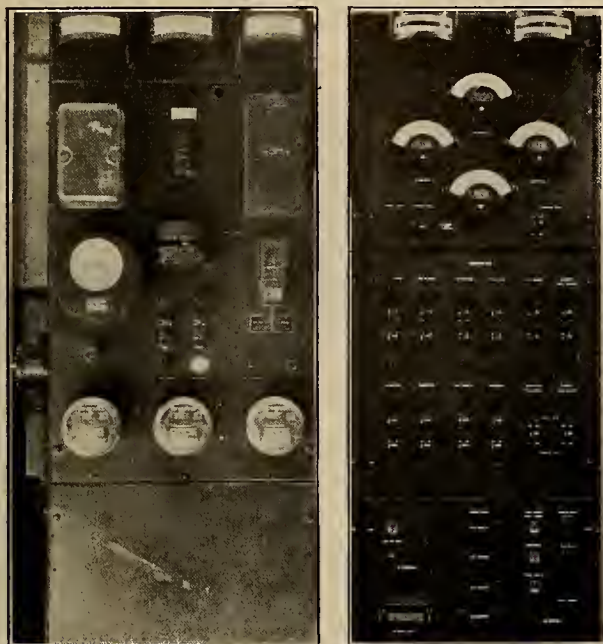


Fig. 3. Typical 4-kv. regulated circuit control panel (left). The bank of regulators is immediately behind the panel. Right—control panel for 9,000-amp., 250-volt converter, station J.

The flashing of the shunt field to insure correct polarity is arranged for either manual or automatic control.

These converters also are arranged with an auxiliary positive d.c. circuit breaker in series with a load-limiting resistor so that upon current reversal of short duration they will drop their load momentarily and return to normal without tripping off the bus. This feature is automatic.

Relay protection is as follows: a.c. induction overload; a.c. induction undervoltage; d.c. reverse power and underload; a.c. and d.c. grounding relay; over-speed device.

Control circuits and switching are so interlocked that an operator cannot risk his own life or damage the converter by making an error. The d.c. switch-board consists of one main bus and one auxiliary bus. Bus-tie breakers of 14,000 amp. normal rating and 28,000 amp. 5-min. overload rating are installed for paralleling. The d.c. feeders are not fused, but are equipped with both positive and negative ammeters.

Railway Apparatus—One 1,000-kva., 600-volt d.c. synchronous converter for railway service is installed. All operations of this machine are automatic, from the closing of the starting switch to the closing of the d.c. bus breaker. They are equipped for manual operation in emergency. The 600-volt d.c. board consists of a machine panel and five 600-volt d.c. railway feeders each equipped with high-speed circuit breaker protection. The relay protection for the converter is the same as for the 250-volt converters.

Miscellaneous

Storage Battery and Chargers—One 60-cell, 200-amp.hr. storage battery of the chloride accumulator type is installed in a redwood cabinet consisting of three shelves each holding 20 cells. The charging apparatus consists of two 7,500-watt, 100-200-volt d.c. motor generator sets driven by 3-phase, 220-volt a.c., 60-cycle induction motors supplied either from the 11-kv. or the 4-kv. house bank. The d.c. charging bus is equipped with a sectionalizing disconnecting switch so that in case a gassing charge is required

the voltage may be raised to 160 volts on one motor-generator and battery while the control lights and switch operations continue at 130 volts during this time, supplied by the second motor-generator set.

Alarm System—An annunciator and alarm system notifies the operator by means of lamp and horn indication in the event of switch trip due to overload, transformer temperature, transformer water failure charging set failure or other difficulties. The

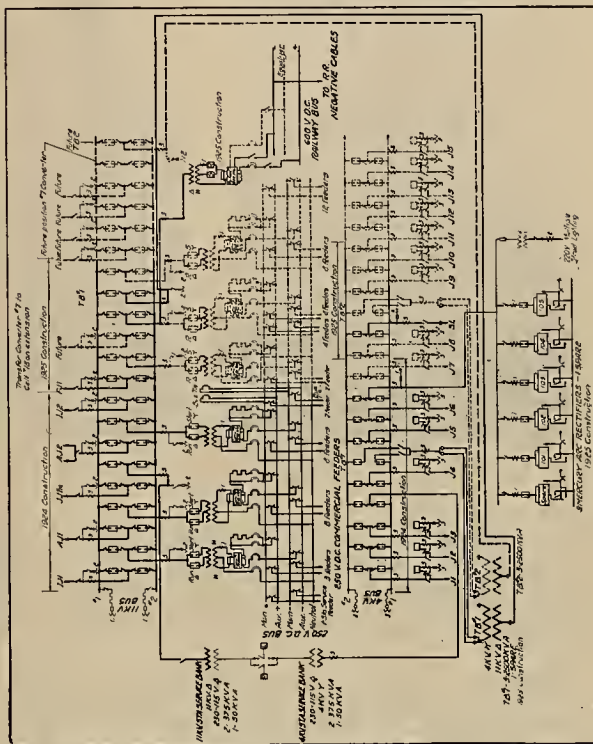


Fig. 4. Single-line diagram of connections, station J.

transformer water is circulated at 7-lb. pressure by two 1½-in. centrifugal motor-driven pumps, one a spare, and cooled by a specially designed cooling tower located on the roof of the building.

Oil Storage—A tank and pump are installed in the basement for oil storage and the piping so arranged that the oil may be pumped from the transformers and stored, filtered, or drained to barrels as required.

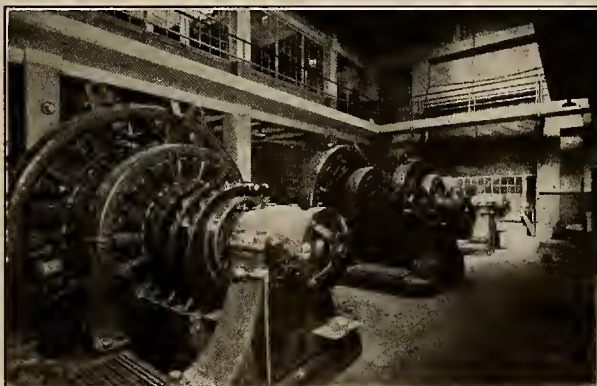


Fig. 5. 9,000-amp. booster converters; operator's room above.

Air System—An air system is installed for washing and circulating air for properly ventilating the building, with special provision for cooling the synchronous converters and induction regulators. Main switches on the blowers are located near the street door so that they may be shut down in case of fire without walking through the building to the basement. Air is drawn from the roof through an air duct to the basement. There it passes through a water-spray washer and drier and is circulated throughout the building from this location. Air ducts

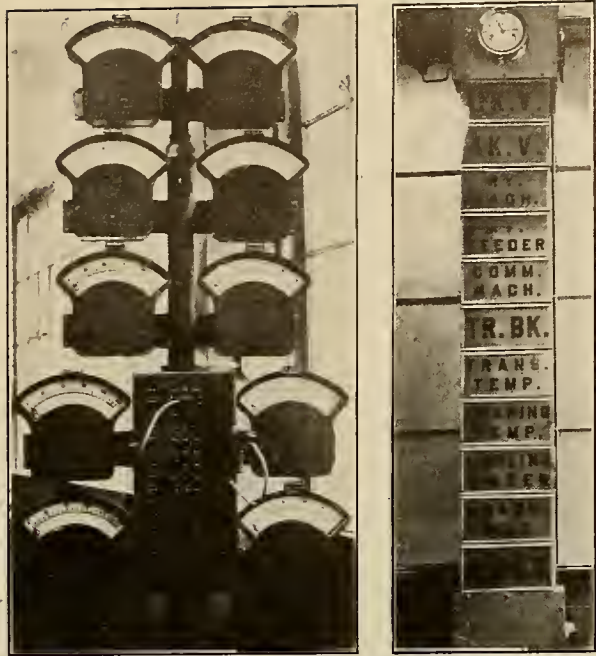


Fig. 6. Annunciator and alarm pedestal (right) and pressure-wire voltmeter pedestal for Edison system (left), station J.

are covered with a cork paint to puevent condensation when they pass over live apparatus or parts which would be damaged by moisture which might otherwise collect and drip. Each duct opening is equipped with a register of special design for controlling the air discharge.

Emergency Lights—Emergency lighting is provided by a relay which, upon failure of the a.c. supply, switches certain circuits normally feeding from the a.c. panel boxes to the d.c. until the a.c. is restored.

This method eliminates dark lamps in the station and saves duplicate circuits and wire. Station light and power is supplied from two banks of transformers fed either from the 11-kv. or the 4-kv. bus respectively. The switchboard for station-power control is of pipe construction with safety-type enclosed fused switches. Station lighting is controlled from dead-front panel boxes on each floor.

General Arrangement

The general arrangement of each floor of the station is as follows:

Basement—Synchronous converter transformers, d.c. circuit breakers and field rheostats, start and run switches, cables and duct lines to street, water circulating pumps, air washer and blowers, oil tanks and pump.

First floor—9,000-amp. converters, 1,000-kw., 600-volt converter, induction regulators, d.c. 260-volt switchboard, d.c. 600-volt switchboard, 4-kv. house bank, 7,500-kva., 11/4-kv. transformer bank, magnitite street lighting transformers.

Second floor—Operator's control room, 4-kv. bus structure.

Third floor—Storage battery and charging sets, air compressor, 11-kv. house bank, switchboard for station light and power.

Fourth floor—11-kv. bus structure and cable cells.

Fifth floor—11-kv. oil circuit breaker gallery.

The present equipment will deliver 7,500 kva. of 4-kv. load, 7,000 kva. of 250-volt d.c. commercial load, and 1,000 kva. of 600/1-volt railroad load. The ultimate development of this station will be double this capacity.

Telephones—No booth is required as the operator's control room is entirely enclosed. The telephone equipment consists of a city phone and one-party-line phone between substations on wires leased from the telephone company. The local intercommunicating phone covers each floor of the building. Magnavox anti-noise phones are used on the main machine floor.

Fire proteccion—Pyrene and soda-acid extinguishers are conveniently arranged on each floor.

Drains—The basement is drained to a sump equipped with a vertical centrifugal motor-driven pump operating under automatic float control.

Street lighting equipment—Five 75-light magnitite street-lighting transformers and two 4-kv. circuits for RO regulating transformer circuits are installed at present.

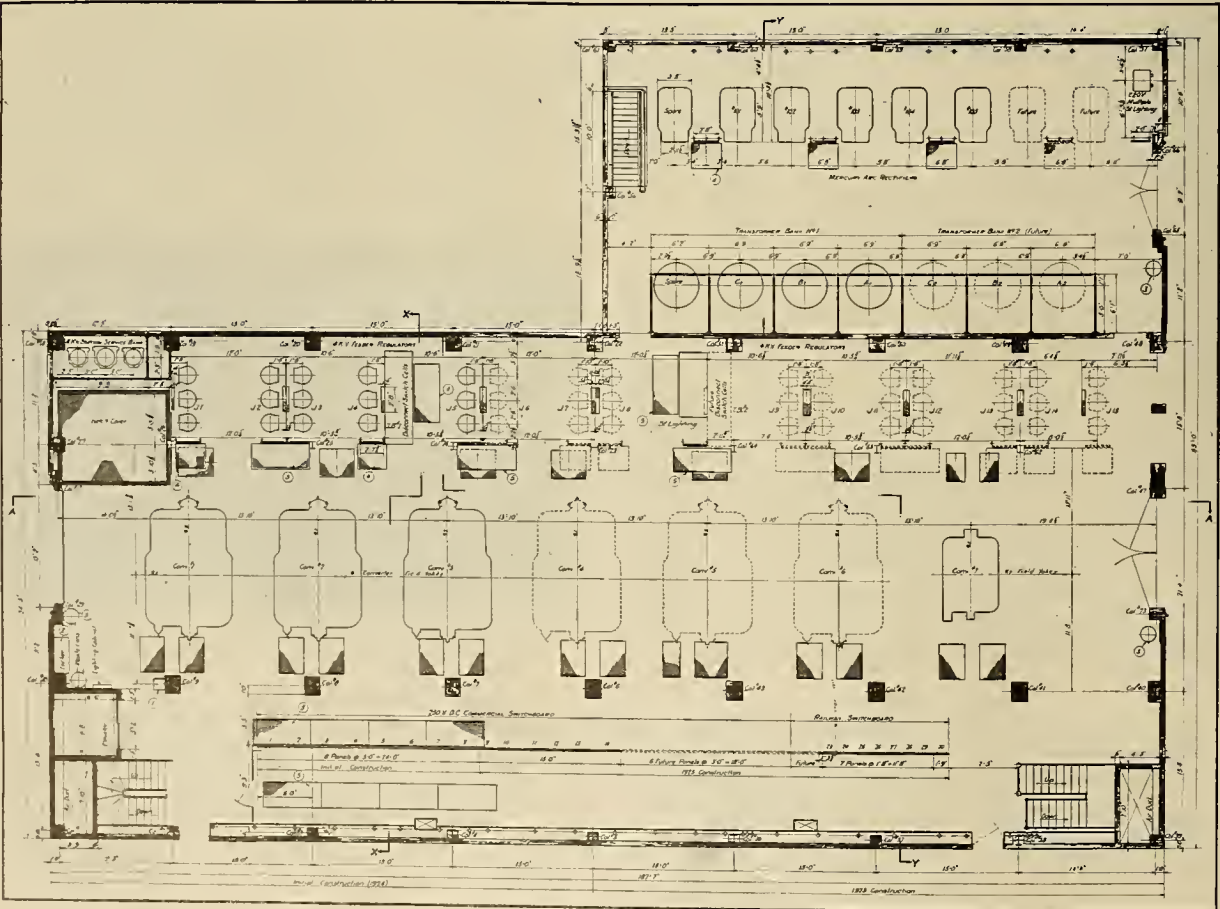


Fig. 7. Plan of first floor showing general arrangement of equipment, station J.

Station L, San Francisco—11/4-kv.

This new substation has been constructed in San Francisco at Ocean Avenue and Junipero Serra Boulevard to serve the rapidly increasing load in the residential districts surrounding this location.

The building is of steel and concrete and of two story design, without a basement. The outgoing and incoming cables are handled in subways under the main station floor. A separate building accomodates the self-cooled transformer bank and the spare unit. Trans-



Fig. 1. Exterior station L giving idea of architecture.

fer switches and a bus for shifting the load to the spare when necessary are provided.

At present the station will deliver 4-kv., 3-phase, 4-wire service, star with grounded neutral for distribution. It is so designed that it may be extended to permit the addition of 600-volt d.c. railway apparatus when the occasion arises.

Station L requires no operators and is equipped with supervisory control from the dispatching station, located approximately four miles distant. The supervisory equipment is capable of operating 50 switches together with all lamp indication over four interconnecting wires. These wires are owned by the Pacific Gas and Electric Company, and are placed underground the entire distance.

Specifications on the interconnecting cable are as follows: 10-pair No. 19 B & S copper insulated with two wrappings of dry paper, two paper tapes over core and a 3/32-in. lead sheath; insulation resistance 500 megohms per mile; and mutual electrostatic capacity not greater than 0.066. Additional wires are for telephone, spares, and other possibilities. The dis-

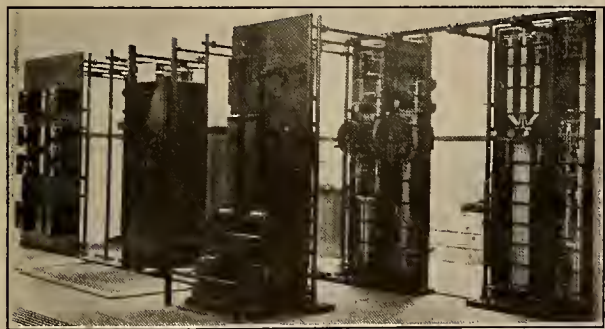


Fig. 2. Switchboard room showing charging sets, supervisory cabinet and control panels, station L.

patcher's switchboard is designed with a dummy bus and control-switch arrangement similar to an operator's switchboard for manual control. This was done to eliminate confusion. At station L the control for all switches is arranged so that by means of a transfer switch the station may be operated manually, with an attendant, or from the dispatcher's station by supervisory control. Wires for the manual and the supervisory control are in separate conduits and have no connection except at the switches which they control. Also, separate batteries and charging apparatus are installed for the supervisory system.

This slight increase in expense of installation is but a small percentage and was made so that in event of trouble with the supervisory system the station could be operated manually by sending an attendant

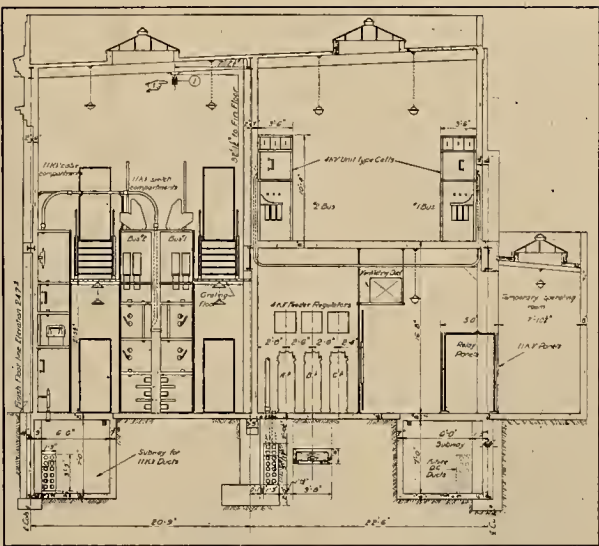


Fig. 3. Section through station L showing arrangement.

there temporarily. This being the case the two systems were installed entirely separate so that neither would be affected by the other in case of line or station supervisory failure. The 11-kv. and 4-kv. buses and the supervisory circuits each have a separate fused control switch and, the station being unattended, it was thought at one time to install a relay or other devices which would give indication in case a control fuse failed. However, this introduced complications and was not done, but left to future experience to ascertain the possibility of demand of such an arrangement.

At present station L is supplied by two 500,000 circ.-mil, 3-conductor, concentric lead cables operated 11 kv., 60 cycles, 3-phase delta and two banks of 3,000-kva. transformers, 11/4-kv., each bank consisting of three 1,000 kva., self-cooled units and one spare. Space is provided for two more banks of 10,000 kva. each in case future load warrants this capacity.

Station Details

11-kv. Apparatus—Two 11-kv., 3-phase, 60-cycle buses, fitted with disconnecting switches between circuit breaker and bus and breaker and line give flexible control of power. Current and potential transformers serve as needed. Type H-203, 3-pole, single-throw, electrically operated (125 volts d.c.), 500-amp. oil circuit breakers are installed. Each group is in a separate compartment built of reinforced concrete and with wood-and-transite doors. At present there are six cells installed but the building is designed to accommodate 14 cells. The 11-kv. bus structure has an iron grating at the circuit-breaker level to permit

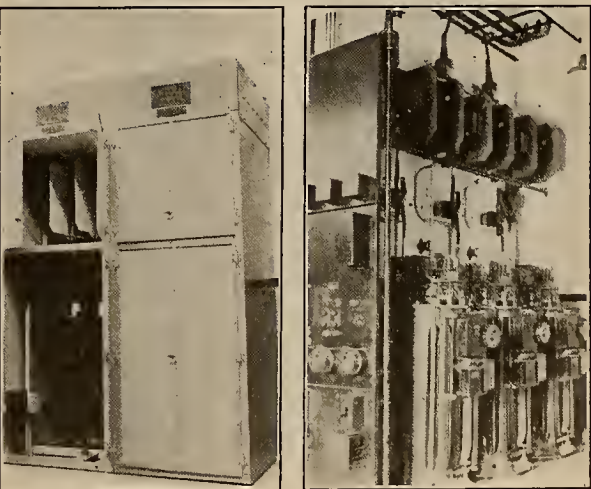


Fig. 4. Right, typical circuit regulator equipment showing control panel in front carrying instruments and manual-supervisory transfer switch. Left, typical all-steel 4-kv. feeder and bus compartments, station L.

working on the switches. Operation indicators of mechanical design are installed to give indication of the disconnecting-switch floor when breakers are opened or closed. A trolley beam is installed over the 11-kv. structure to permit easy handling of the breaker mechanisms for installation and repair.

The 11-kv. incoming cables are equipped with ammeters and induction-type reverse-power relay protection. No reactors have been provided for.

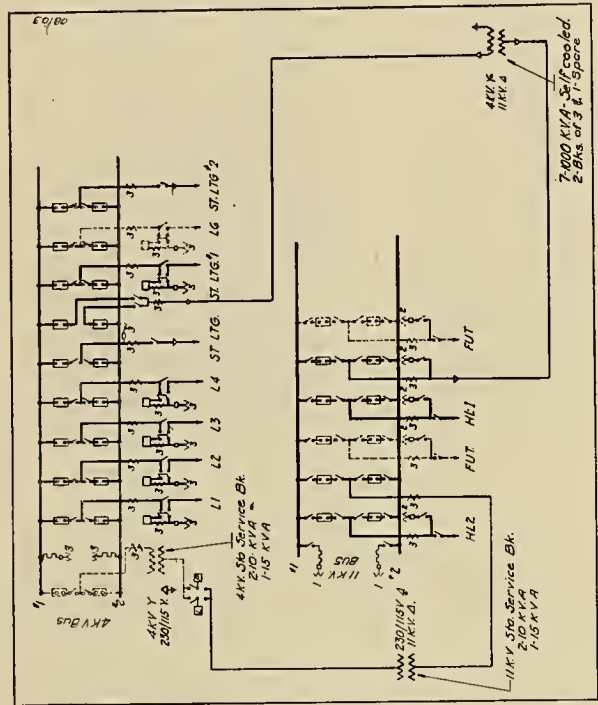


Fig. 5. Single-line wiring diagram, station L.

Transformer banks—Installed in separate buildings are seven 1,000 kva. OISC units, 11/4-kv., 6 main and one spare. A transfer bus and switches in concrete-and-transite cells permit cutting in spare units under load. Watthour meters, indicating wattmeters and overload induction relays are on the 11-kv. side; the 4-kv. side is non-automatic, ammeters only. Interconnecting cables are paper-insulated, lead-covered

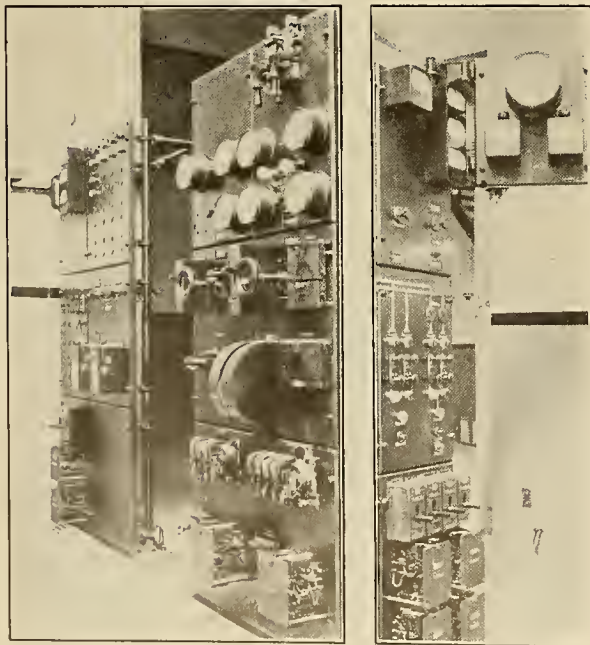


Fig. 6. Right, 11-kv. circuit control panel showing supervisory transfer switch and trip-free relays on lower panel. Left, 4-kv. indicating and transformer control panels; automatic trickle-charge control panels in foreground, station L.

and are installed in 3½-in. fiber duct. Temperature alarm indication at the switchboard when the station is operated manually. No alarm indication is provided for when operated by supervisory control.

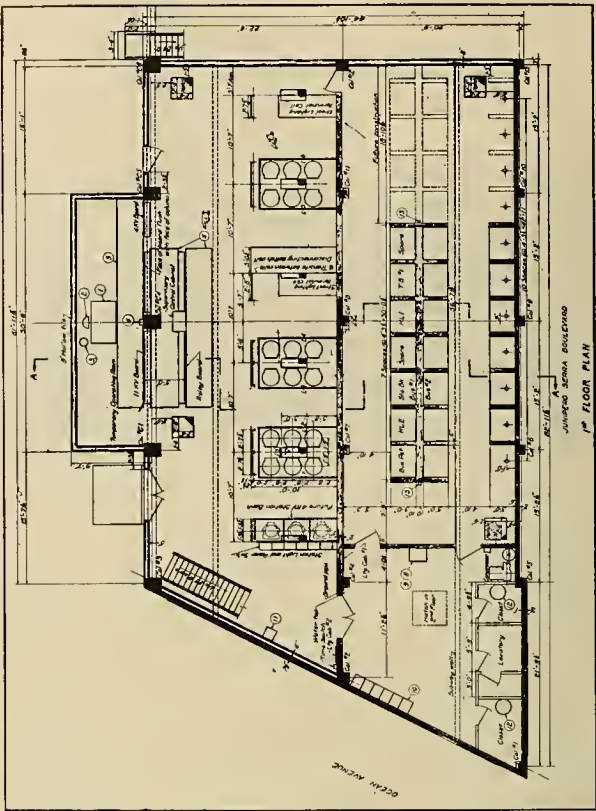


Fig. 7. Plan of first floor, station L.

4-kv. apparatus—At present there are seven cells installed, but the building is designed to accommodate 14 cells. Two 4-kv., 3-phase-Y buses are provided. Disconnecting switches are installed between the lines and breakers only. Circuit breakers are in all-steel-and-angle-iron cells fitted with steel doors. Separate compartments are arranged for breakers, disconnecting switches, and bus. Steel unit-cells are on the second floor; current transformers, regulators and auxiliaries are directly below on the main floor. Oil circuit breakers are 400-amp., 3-pole, single-throw, K-132 B, and solenoid-operated at 125 volts d.c. No provision has been made for reactors. Three single-phase, 200-amp. induction regulators are installed for each feeder. All regulators are mounted on cork pads to reduce vibration and consequent noise. Auxiliaries are mounted on panels on the regulators. Each regulator bay is equipped with an easily removable oil dam to confine the flow of oil in case of explosion. The control panel for each feeder is mounted at the regulator bay. This panel has three ammeters, control switches and lamps, curve-drawing voltmeter, relays, and transfer switch to provide either manual or supervisory control. A grounding relay is connected in series with the regulator ground wire so that in case of regulator failure the relay will clear it from the bus and sound an alarm.

Street light circuits are operated single phase and controlled by standard 4-kv. feeder equipment. Each single-phase circuit is used to supply RO street lighting transformers in the surrounding district. In case any oil circuit breaker trips, the circuit in trouble is identified by means of the target indication in the induction overload relay. By means of a disconnecting switch the faulty phase may be opened and the breaker closed again.

Station service is supplied by an 11-kv. transformer bank with standard 11-kv. equipment plus a watthour meter. These station service transformers have special high-tension taps to reduce the low-tension voltage to within the rating of station auxiliary apparatus.

Grounds—All grounding wires including the 4-kv. transformer-bank and feeder neutral are brought to two copper ground buses located one at each end of the station. These copper ground buses are connected to groups of four copper ground plates buried to a depth of permanently moist earth and embedded in charcoal ground to the size of a chestnut. Water is piped to each set of plates for watering the ground periodically. The flow is regulated by valves mounted in the station near the ground buses.

Miscellaneous

Station control battery—The main control battery is composed of 60 E11 chloride cells, 120-140 volts d.c., mounted in a redwood cabinet fitted with sliding glass doors. This battery receives a trickle charge from a 1,500-watt-motor-generator set automatically controlled for stop and start in case of a.c. failure. Automatic relays keep the charging set off the line unless the d.c. charging voltage is 129, or 2.15 volts per cell. In case the charger fails on indication an alarm is given to the dispatcher in the controlling station, if operated by supervisory control. If the

station is being operated manually at the time of failure a signal and alarm is sounded in the station on the annunciator.

The supervisory system has its own 120-volt battery composed of 60 7-amp.-hr. chloride cells mounted in a separate redwood cabinet. This battery receives a continuous trickle charge from a 250-watt motor-generator set automatically controlled similar to the main control-battery equipment.

Telephones—The telephone equipment consists of one city line and one local substation line. No booth is required as there are no rotating machines and no noisy apparatus in the room.

Alarm system—If the station is being operated manually the transfer switch for manual control automatically cuts in the station alarm and annunciator system which will continue to function until the transfer switch is thrown to the supervisory position. The alarm system consists of annunciator units which light a white light behind a ground-glass panel bearing the names of the piece of apparatus in trouble. At the same time a signal horn sounds and a white bull's-eye lights up on the panel upon which the particular feeder control is mounted. The horn and white light continue until the operator releases them by pushing a release button on that panel. One feature of the alarm system is that no indication or alarm will be given unless the breaker has tripped due to the action of the relays and not by manual operation.

Lighting system—One special feature of the lighting system is that no emergency lights are installed. This eliminates double fixtures in places where space is limited. An emergency fixture always is dark except in the event of trouble, and is unsightly and increases the cost of conduit, wire and fixtures. The lighting system used comprises several circuits from the main panel box which, by means of a relay, are transferred automatically from a.c. to d.c. upon failure of the a.c. house service.

Air system—The building is laid out for air cleaning and forced ventilation when such becomes necessary.

Fire protection—No fire protection is installed other than fire extinguishers located on each floor.

Landscaping—Trees were purposely left upon the site where they did not interfere and shrubs and flowers planted at suitable places. An automatic sprinkler system with spray nozzles and valves is installed to water the lawn. Ornamental lamp posts are installed to illuminate the grounds and drives.

Almaden Substation—11/4-kv. Rural

Almaden substation is a modern rural distribution station located in the vicinity of Almaden, approximately 10 miles from San Jose, Calif. It supplies power at 4 kv., 3-phase for irrigation and farm equipment in the surrounding district.

The interesting feature of the Almaden substation lies in the fact that with the exception of the transformers, and regulators when installed, all the switches, relays and instruments are located in steel unit-cells

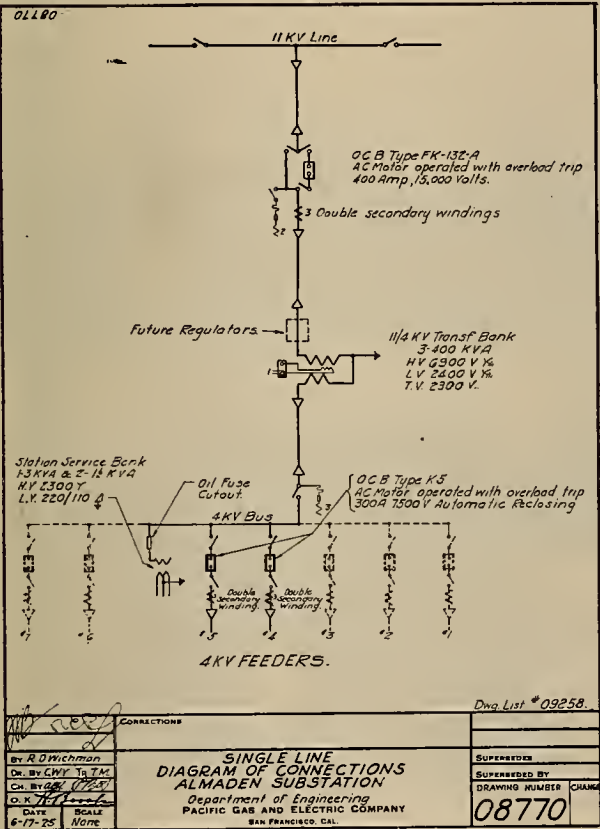


Fig. 1. Single-line wiring diagram, Almaden substation.

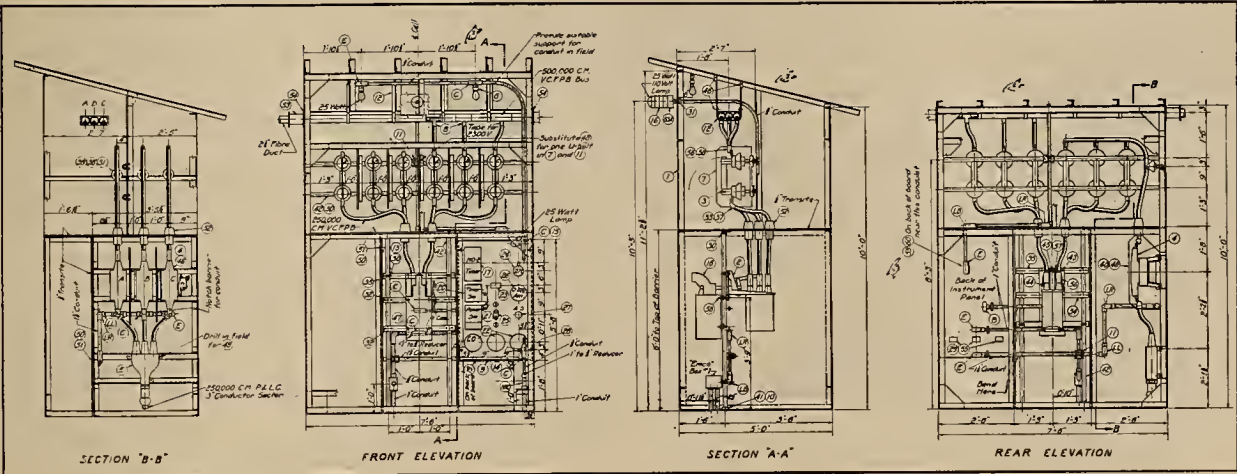


Fig. 2. Details of 4-kv. switching and metering equipment housed in steel unit-cells, Almaden substation.

and that the 11-kv. and 4-kv. cables to the transformers are lead covered, the lead wiped directly to brass nipples in a cable terminal box which is a part of the transformer itself. This arrangement permits the use of indoor equipment without requiring a building to house it.

The steel unit-cells are 6x9 ft. in plan and 11 ft. high, with steel doors front and back to permit of access to all parts of the equipment. They are built on $2\frac{1}{2} \times 2\frac{1}{2} \times \frac{1}{4}$ -in. angle frame covered with No. 18 gage sheet steel. Each cell is equipped with suitable light and power outlets. Insulated wooden platforms are installed outside of and opposite each set of doors.

Station Details

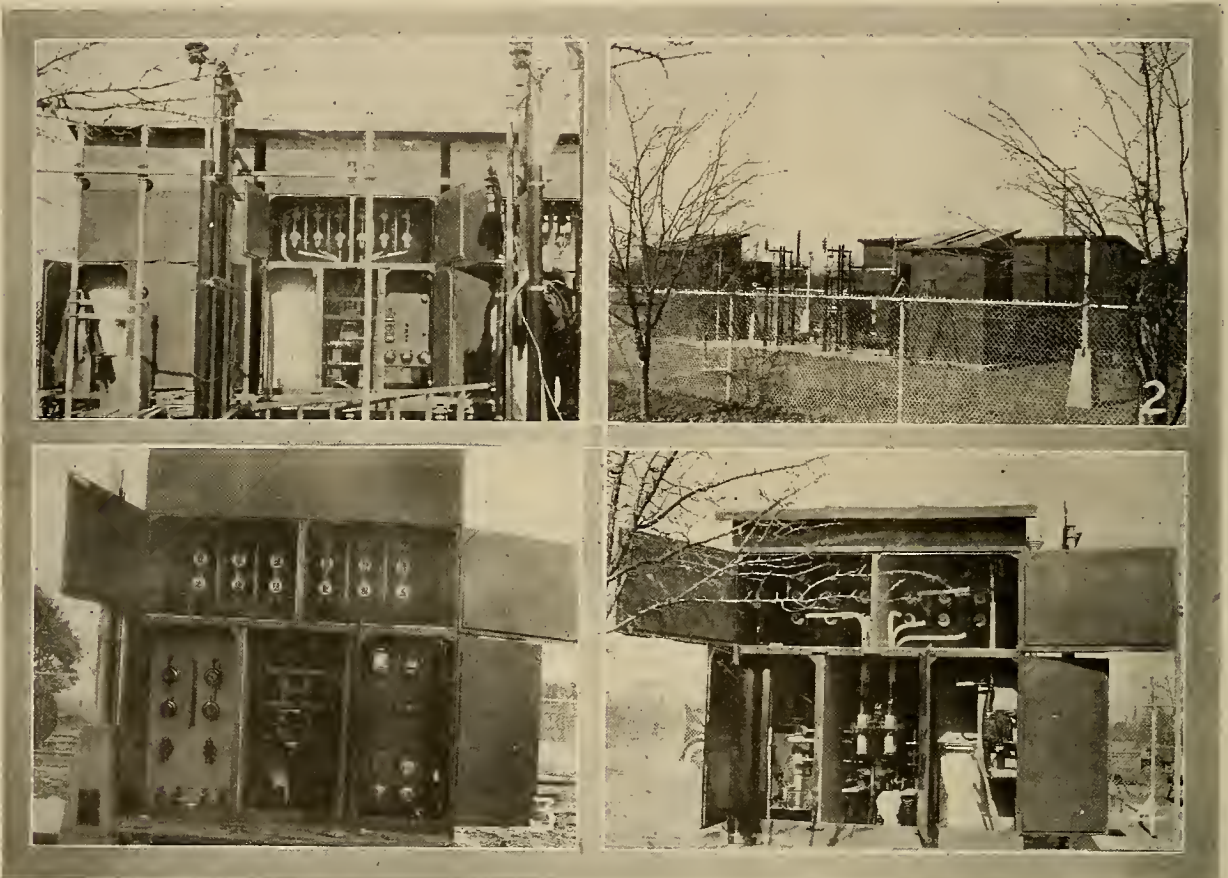
Incoming lines—Two 11-kv., 3-phase, 60-cycle-Y, grounded overhead lines are brought in to a dead-end pole and equipped with air-break disconnecting

former leads to the single bus; one 4-kv., 3-phase-Y-distribution feeder equipped with one K-5, 300-amp., 7.5-kv., 3-pole, single-throw oil circuit breaker with an MK-3 a.c. operator and tripping reactors, disconnecting switches each side of the breaker; three overload induction-type relays; current and potential transformers; one recording voltmeter and voltmeter switch; one MD-2 automatic-reclosing timing relay; and one type H-2 demand meter.

Station light and power cell—One steel-unit cell contains three $1\frac{1}{2}$ -kva., single-phase, 2,300/230 115-volt, OISC transformers equipped with S&C fuses.

Station utility cell—One steel-unit cell contains telephone equipment; lighting cabinet; spare parts; service equipment.

Station grounds—All switch frames and structural steel and neutrals are connected solidly to two ground plates buried in permanently moist earth. The ground



Almaden substation: (1) 4-kv. all-steel compartments for outdoor service; (2) general view; (3) steel compartment for 11-kv. control panel and disconnecting switches; (4) steel compartment for 11-kv. oil circuit breakers and current transformers.

switches, and thence through lead cable to the transformer-bank cell.

Transformer bank cell, 11 kv.—Each steel-unit cell contains one K-132-A, 400-amp., 15-kv., 3-pole, single-throw oil circuit breaker equipped with MK-3 a.c. operator; three overload induction-type relays with tripping reactors; one polyphase watthour meter; one curve-drawing ammeter and ammeter switch; and current and potential transformers. Disconnecting switches are installed each side of the breakers; by-pass disconnecting switches provide emergency control.

Main transformers—Three 1,000-kva., OISC, 11/4-kv., single-phase transformers equipped with terminal boxes and brass nipples for lead-cable connection are installed. Both high-tension and low-tension leads thus are weather-proofed.

Transformer bank and feeder cell, 4.1 kv.—Each steel-unit cell contains disconnecting switches on trans-

plates are cast iron 18x30 in. in dimension. No charcoal was used.

All station equipment is mounted on a concrete pad 6 in. thick and reinforced with $\frac{3}{8}$ -in. steel rods in both dimensions.

Only a portion of the lot is occupied, the station requiring a space 60x80 ft. This space is enclosed by a 6-ft. non-climbable Cyclone fence with a 12-ft. gate to permit entrance of trucks.

Outdoor regulators may be installed when required and the station is designed for additional feeders when the load demands such extension.

The 4-kv. feeders are automatic reclosing and no operator is required. Periodic inspection insures satisfactory operation and in case of a feeder lockout the customers are depended upon to notify the operating department.

Outside lighting comprises six single-light iron posts each equipped with a 200-watt lamp.

Gonzales Substation, Coast Valleys Gas & Electric Company; 55/4 kv.

By T. W. SNELL

This substation, which has an electrical design similar to that proposed for future rural substations, was built to replace an overloaded and unsightly old substation. Additional property was purchased so that the new station was built without interference to service. As the station is located on a main state highway an effort was made to obtain a pleasing appearance. The station is unattended, but sufficient property was purchased to add an operator's cottage in the future and to provide storage space.

High Tension

The station is supplied by tapping a 55-kv. loop transmission line. K.P.F. pole-top disconnecting switches are mounted on each side of the station to give selectivity when necessary or desirable. The rack is a delta-star galvanized structural steel design carrying a 73-kv., 3-pole disconnecting switch, transformer fuses, and disconnecting switches for primary and secondary side of each transformer bank.

Transformers as installed include three 400-kva.,



Fig. 1. Partial front view Gonzales substation. Lot is to be graded and landscaped to improve appearances.

55-kv. delta to 4-kv. star, self cooled; one 750-kva. spare.

As the summer peak is considerably greater than the winter load, both banks are operated in parallel during the irrigation season and the larger bank cut out during the winter.

Protection—S&C. 73-kv., 100-amp. fuses are used to protect the 55-kv. line against transformer failure or bus trouble. No instruments are installed on the 55-kv. side.

Low Tension

The 4-kv. equipment all is indoors, mounted on 1½-in. pipe framework. The 4-kv. leads from transformers to bus are of open wiring, entering the building in the rear through wall bushings.

Regulators—Three 200-amp. single-phase regulators are used on one circuit supplying a small town, a factory and various pumping plants within a ¾-mile radius. Three 300-amp., single-phase regulators are used for regulating the longer feeders.

Circuit breakers—The three 4-kv. feeders are equipped with Condit 400-amp. 15-kv. oil switches equipped with Condit individual solenoid automatic reclosing mechanism. Relays are set for three reclosures 8 sec. apart before lockout. Outages on the town circuit are reported by the factory which has 24-hr. attendance; outages on the farmer lines are reported by any customer affected.

Miscellaneous

Electrical Protection—The 4-kv. breakers are equipped with General Electric induction overload relays. The station transformers and future arc tub will be protected with S&C fuses.

Switchboard—Three panels of ebony asbestos 24x90 in. are used for mounting instruments, relays and controls.

Lines—All feeders are carried underground out of the building to nearby pole lines. Cables are lead-covered, in rigid iron conduit.

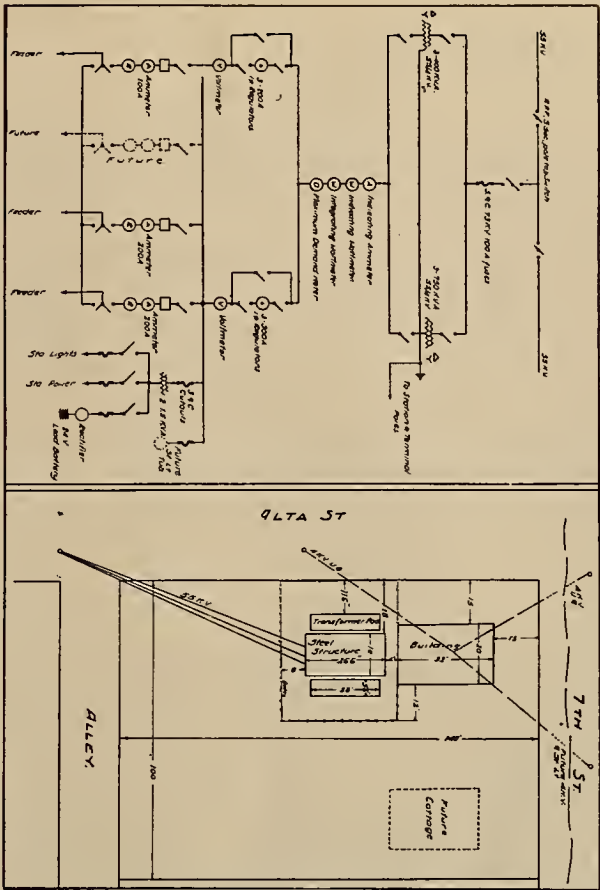


Fig. 2. Below—plot plan of substation grounds. Above—single-line wiring diagram; Gonzales substation.

Buildings—The substation building is of steel frame, with hollow-tile walls and concrete floor and roof. The outside of the building is stucco. Outside dimensions are 40x32 ft. in plan and 20 ft. high. The outdoor apparatus is surrounded by a Cyclone steel fence.

Miscellaneous electrical—A 24-volt lead battery, charged by a vacuum tube rectifier, is used for d.c. supply. The ground system is a network of 4/0 bare copper cable connected to three driven pipes.

Compton Substation, Southern California Edison Company; 15/4 kv.

By H. L. SAMPSON

The Southern California Edison Company serves many small towns and parts of larger communities where the total load is between 500 and 3,000 kva., and where this load can be kept very evenly divided between three phases. Therefore a standard type substation has been developed for this work; of this standard Compton sub is a good example. It should be noted that provision is made throughout for enlargement from the present size to an ultimate of

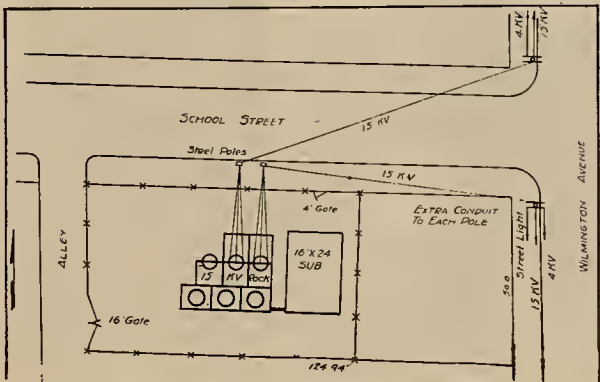


Fig. 1. Plot plan, Compton substation.

3,000-kva. capacity, to be served through two 3-phase regulators to 8 circuits. Two of these probably will be controlled street-light feeders.

Equipment—15 kv.

A single bus and switching equipment for two lines and one transformer bank is supported on a 3-section outdoor rack built up of 3 lattice-steel poles and 2-in. standard galvanized pipe. (See Figs. 1 and 3.) The transformer bank consists of three 500-kva. single-phase self-cooled units connected delta star. The 15-kv. circuit breakers are hand operated. The transformer switch is provided with a by-pass.

Electrical protection—Graded-resistance lightning arresters with disconnecting switches are installed on

relays with their control switches and in addition the pull-button switches for electrically tripping the line and transformer switches.

Equipment—4 kv.

The 4-kv. equipment is all indoors and is carried on 1¼-in. standard iron pipe framework. See Fig. 4.

Regulators—Provision is made for two 4-kv. 200-amp. 3-phase induction regulators; with only one installed initially. The automatic equipment is mounted on a panel beside the 15-kv. panel. This panel also will carry the handle of a 4-kv. breaker to be installed ahead of the regulator when a second regulator becomes necessary. See Fig. 2.

Circuit breakers—The 4-kv. feeders are equipped with 300-amp. oil circuit breakers with automatic, motor-driven reclosing mechanisms. The street light circuit, also equipped with reclosing mechanism, is provided with one double-pole and one single-pole oil switch. These are so arranged that a time clock closes all three legs at one time but opens the two elements at different times; the reclosing feature is effective on all or part according to service condition. This is to provide double-schedule service. All reclosure relays are set for successive periods of 2, 15 and 30 sec.

Electrical protection—All 4-kv. feeders are protected by overload plunger-type relays operated from current transformers. Lightning and high-voltage protection is provided by distribution-type arresters located on poles just outside the station.

Switchboard—The panel which carries the total-load meters is located on the center line of the building. This provides for four positions on each side if, and as required. The space above the totaling meter panel will be used for a disconnect switch panel to tie the two halves of the bus together. Panels are of black, marine-finish marble, 28x48x2 in. with 24-in. sub-panels.

Graphic meters are used on the total load to provide a record of operation, as these stations are unattended.

Miscellaneous

Light and power for the regulator motors and reclosing mechanism is supplied from two 2-kw. transformers connected to the unregulated bus by high-rupturing-capacity fuses.

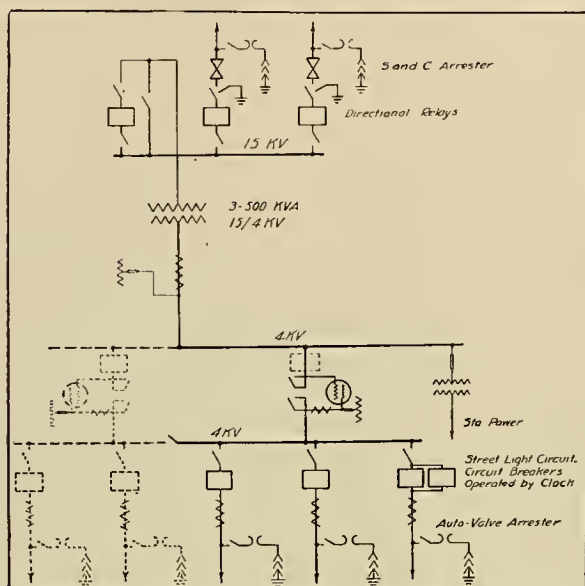


Fig. 2. Single-line wiring diagram, Compton substation.

each line. The lines are provided with directional relays operated from bushing-type current transformers in the circuit breakers. Potential is taken from the 4-kv. bus. The transformers are protected by induction overload relays also operated by bushing-type current transformers.

Switchboard—One panel, located between the two regulator panel positions carries the three sets of

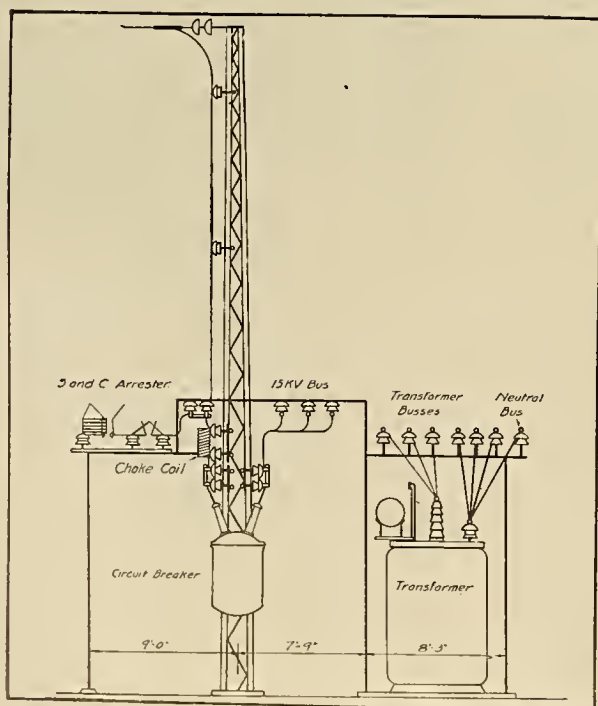


Fig. 3. 15-kv. rack section, Compton substation.

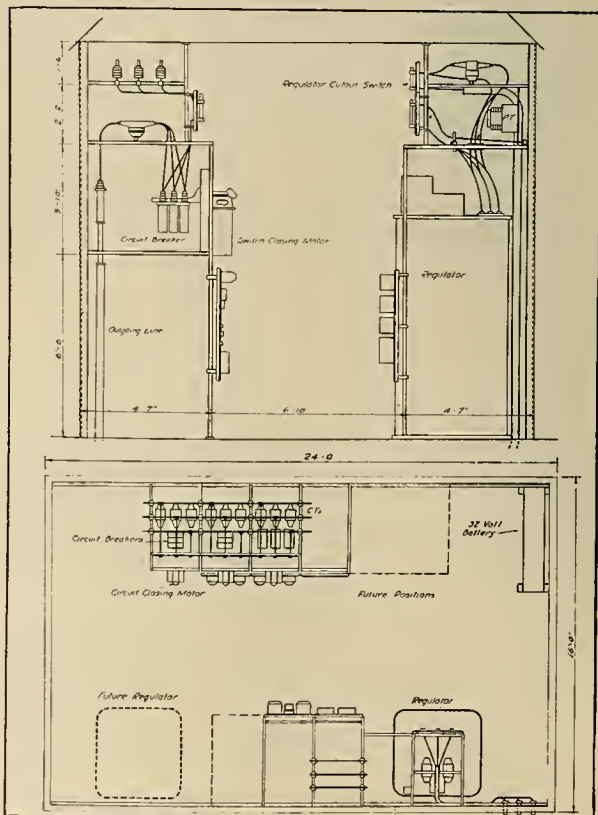


Fig. 4. Below—Plan of indoor equipment. Above—Section through indoor equipment.

All 4-kv. feeders are brought out underground to pole lines in the street through 3-conductor, paper-insulated, lead-covered cable.

The building consists of a steel frame covered with flat sheet steel. It is 16x24x14 ft. in dimension and has a concrete floor. By careful arrangement of windows and by painting the body pearl gray, the trim a darker gray and the roof a mission tile-red, a cheap fire-proof building has been made which is not objectionable in most locations.

A 32-volt lead storage battery is provided for relay operation and is charged from a vacuum-tube rectifier.

The grounding system consists of a network of bare 4/0 cable which surrounds the rack and building and is connected to all post members of the rack, all steel poles, the building, wire fence, and the transformer neutral. Copper-weld ground rods are driven and connected at various points about the network. A separate system of ground rods is provided for the lightning arresters.

All wiring is in iron conduit laid in concrete where underground and all underground wires are lead-covered.

No alarm system has been provided although serious consideration has been given to the idea of providing some arrangement for using the telephone line

to transmit a signal to some nearby attended station in case of trouble. These stations also offer a fine opportunity to use some kind of supervisory system of control.

A 6-ft. heavy galvanized wire-mesh fence surrounds that part of the property used for station purposes.

Special switches and terminal strips are provided in the relay and control circuits for testing facilities.

Anita Substation, Southern California Edison Company; 60/15/4 kv.

By H. L. SAMPSON

This station is typical of the company's design of a transmission and distribution substation. Power is received at 60 kv. and distributed at 15 and 4 kv. Equipment for the two higher voltages and all transformers are located outdoors. The 4-kv. bus, regulator and circuit breakers are indoors as are the control board, meters and relays for all of the equipment. The station is in a rural district 15 miles northeast of Los Angeles. It serves a rural load, an interurban railway substation and three distribution substations. It was built in 1925. Fig. 1 shows general views, Fig. 2 wiring diagrams, and Fig. 3 a

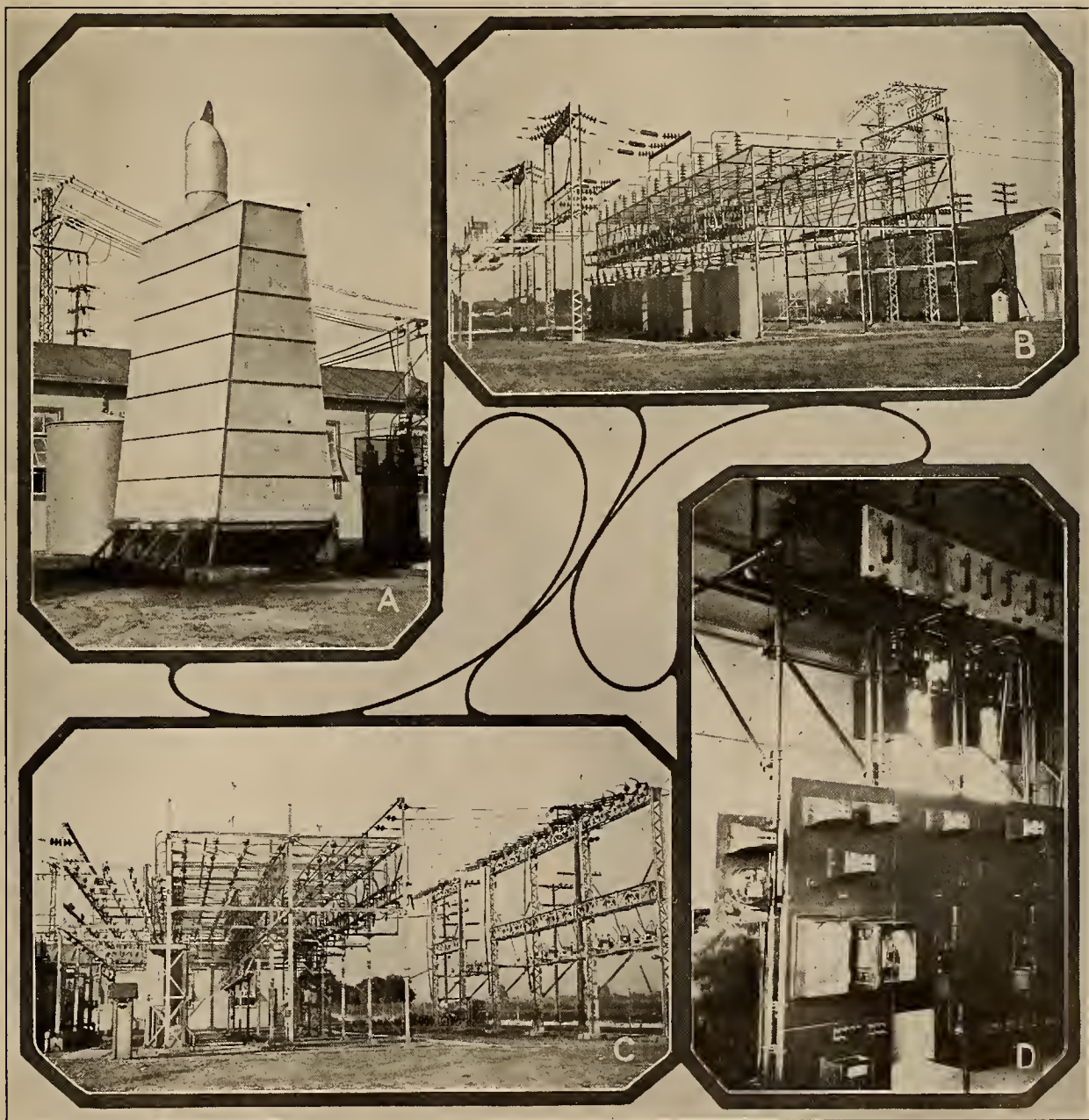


Fig. 1. (A) Cooling tower for transformer oil, and oil storage tank. (B) Substation building and 60-kv. switch rack. (C) 15-kv. switch rack and transformer bus. (D) Indoor 4-kv. switching equipment, Anita substation.

plot plan of the grounds and a section through the station building.

The division between outdoor and indoor equipment as cited above is on an economical basis, assures a minimum hazard to service in case of trouble and allows maximum spacing of equipment for maintenance purposes. The location did not cramp the design for lack of space, or require the architectural and highly protective features necessary in city substations. The initial installation provides facilities for a 50 per cent increase in the number of lines and over 100 per cent increase in capacity.

Equipment—60 kv.

Rack—There are four 20-ft. sections of structural frame work; two lines, one transformer and one bus-tie. The structure is arranged for a main and a transfer bus with the circuit breakers on the outside of the equipment. The design allows for the addition of a circuit breaker in each position should future duty on the station indicate that it is desirable to have a full double bus with duplicate circuit breakers for each circuit. See Figs. 1B and 4.

The steel frame work is of very light construction, but entirely adequate for the mild climatic conditions of southern California. Insulators are of the common

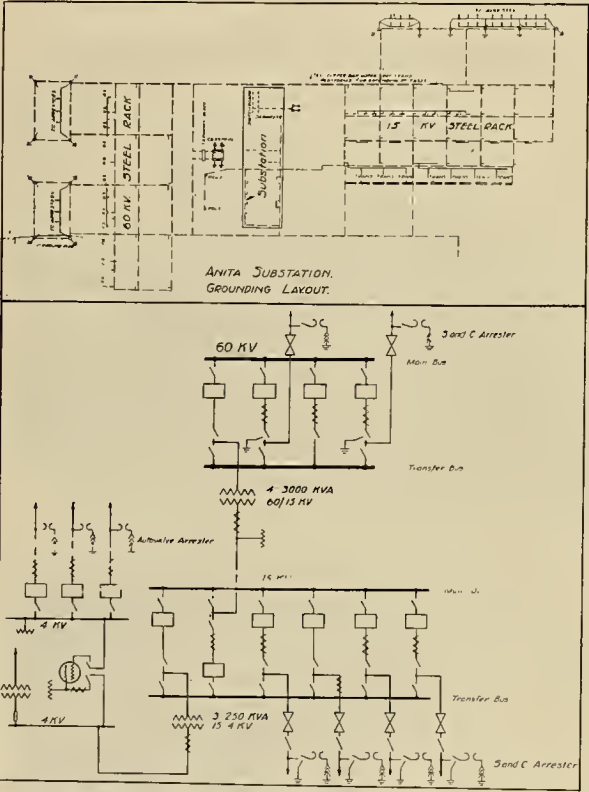


Fig. 2. Below—single-line wiring diagram. Above—grounding layout; Anita substation.

10-in. disc-type porcelain built into pillar units both for bus supports and for disconnecting switches.

To clean the insulators from dust deposits water sprinklers of a common garden rotating type have been placed above the bus work on both the 60-kv. and 15-kv. racks. It has been found that these can be safely operated with the bus energized. There has been some trouble with the type of sprinkler head used, but the method has proved excellent and is in regular use. No labor has been necessary to date for other methods of cleaning the insulators.

Oil Circuit Breakers—These are of a type having 6 series breaks, a normal rating of 400 amp., 70 kv. and an interrupting value of approximately 400,000 kva. They are electrically controlled, but operated by compressed air. There are two bushing-type current transformers per pole with all the ratio taps brought to a common terminal board in the mechanism housing. Control power is from a storage battery in the building and the operating air from an air compressor in the building and air receivers near the circuit breakers.

Transformers—Three 3,000-kva. single-phase transformers are connected delta-star for a 66/16.5 ratio; one spare transformer is arranged so that it can be put into service by changing connections, but without moving the units. The transformers are cooled by circulating the oil through radiators separate from the transformers. These are in a chimney-shaped struc-

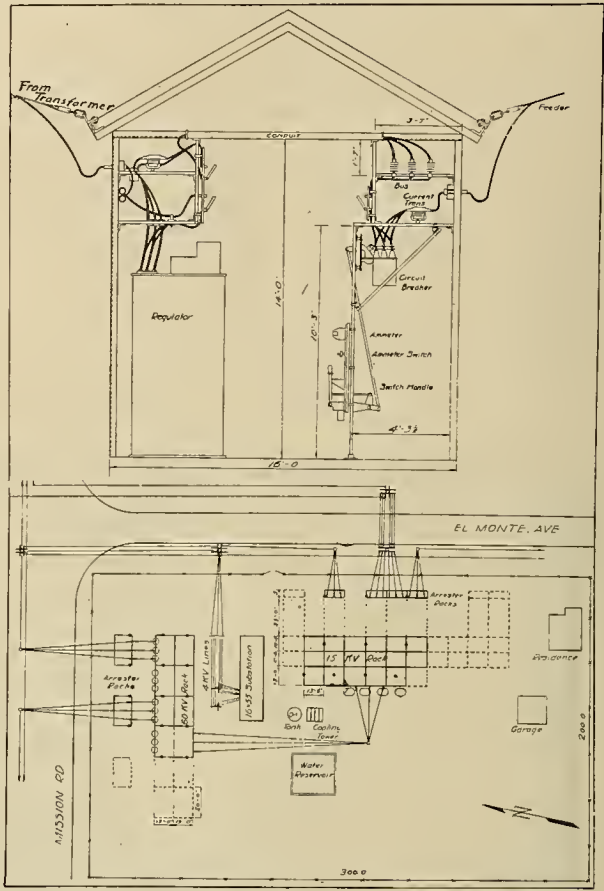


Fig. 3. Below—plot plan. Above—section through station building, Anita substation.

ture of sheet iron that produces a natural draft for cooling. See Fig. 1A.

The neutral is grounded through a current meter transformer to a ground net-work of copper cables that is carried entirely around the rack and connected to the steel and to the circuit-breaker tanks. The ground system will be described in detail later in this paper.

Electrical Protection and Control—Graded-resistance lightning arresters are connected through disconnecting switches to the lines. Transformers are protected by induction-type inverse-time overload relays. Lines and bus-tie have induction-type power-directional relays.

A vertical switch board of 32x90-in. slate panels is provided for controls and relays. The control and relay boards are placed back to back with 4 ft. between. A pit beneath the switchboards provides space for terminating the cables from the rack and for transferring connections between panels. Special terminal blocks have been arranged at the base of the panels and at right angles to them to allow as much room as possible for connections. The current-transformer leads for relays are connected to short-circuiting and disconnecting switches for use in testing. A single-pole knife switch is placed in the relay trip lead to each circuit breaker so that the breaker may be made non-automatic when desired.

Equipment—11 and 15 kv.

Rack—This is similar in construction and arrangement to the 60-kv. rack. The sections are each 13 ft. 6 in. wide, allowing room to change the circuit breakers to a type with higher rupturing capacity when the transformer capacity is increased. Pole-top disconnecting switches have been placed in the lines in

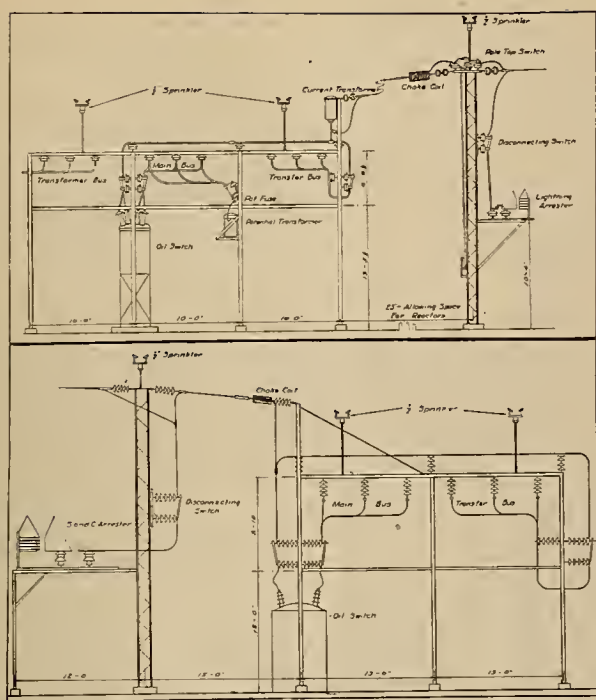


Fig. 4. Section through 60-kv. rack (below) and through 15-kv. rack showing location of sprinklers and other arrangements, Anita substation.

such a position that the lines may be cut loose from the station and either grounded or left energized from another station. Space has been provided for the future installation of current-limiting reactors to handle future capacity. See Figs. 1C and 4 for the equipment. Arrangements for washing insulators are similar to those on the 60-kv. rack.

Oil Circuit Breakers—These are single-tank multiple-break switches rated at 300 amp., 15 kv., with an interrupting capacity of approximately 100,000 kva. They are air operated, electrically controlled and have one bushing-type current transformer per pole. The control and operation is similar to the 60-kv. breakers described above.

Transformers—Three 250-kva., self-cooled, single-phase transformers are connected delta-star for service to the 4-kv. indoor regulator and bus. The construction provides for changing these to three 1,000-kva. transformers when the load increases. The 4-kv. neutral is connected not only to the general ground system of the station but is extended to the fourth overhead wire of the 4-kv. distribution lines.

Electrical Protection and Control—Graded-resistance lightning arresters are provided for each line. Induction-type inverse-time relays are used for overload protection of each circuit.

Meters, relays and controls are on the same panels with the 60-kv. equipment and are arranged in a similar manner. The control board has the usual installation of mimic bus and indicating lamps.

All 4 kv. equipment is indoors, mounted on 1½-in. pipe framework. See Fig. 1D.

Oil Circuit Breakers—Hand-operated, 300-amp., 7.5 kv. breakers are used, having a rupturing capacity of 25,000 kva. They are provided with secondary overload plunger trip coils in the operating handles. The overhead mounting and control rods are plainly visible in Fig. 1D.

Regulator—Voltage is held constant by a 3-phase, 100-amp., induction-type regulator in the transformer feed to the bus. Space has been left so that this can be replaced by two 200-amp. regulators. By-pass switches are arranged to cut the regulator out of service for maintenance purposes.

Lightning Arresters—Distribution-type lightning arresters are mounted on the first pole away from the station.

Buildings—The substation is a 16x56-ft. sheet-metal building made from two 16x24-ft. buildings such as used at smaller stations. A cottage is provided for the regular operator and his family. A combination

garage and sleeping quarters are provided for the relief operator. Regular fire protection for this class of station is as follows:

- One 10-gal. Carbon tetrachloride engine on wheels.
- One 1-gal. Carbon tetrachloride extinguisher.
- One 2½-gal. Foam extinguisher.
- Two 1-qt. Carbon tetrachloride extinguishers.

See also the water hydrants on Fig. 3.

Oil Storage and Handling—A tank for oil, of sufficient capacity to empty a transformer or a three-phase oil circuit breaker, is provided. Pipes are run to a point near the transformers and circuit breakers where temporary flexible connections can be extended to the units. Filtering is done with a movable filter press by circulating the oil from the bottom to the top of the operating unit or oil tank. Pumps for circulating the transformer oil and for emptying the circuit-breakers tanks are located in the substation building. Power outlets are provided at the racks for filter press operation.

Water—To avoid drilling a deep well, water is purchased from a rancher adjacent to the property and stored in a 26x26-ft. concrete reservoir of 30,000-gal. capacity. Pressure for sprinkling system, fire and irrigation is obtained by using a motor-driven multiplex centrifugal pump; capacity of pump being 120 gal. per min. against 150-ft. head.

Water for domestic purposes is supplied from the main reservoir through a 200-gal. home water plant thus assuring pressure independent of fire and irrigation pump.

Battery and Charger—The battery used at this substation is rated 32 volts, 80 amp.-hr. The charging equipment consists of a motor-generating set, the motor of which is a ¾-hp., 220-volt, 50-cycle, 3-phase, 1,450-r.p.m. induction type. The generator is rated at 0.4 kw., 40 volts, 10 amp., 1,450 r.p.m., and is shunt wound. A switchboard for this charging equipment consists of a voltmeter, 0 to 50-volt range, and an ammeter with a zero-center scale, range 0 to 30 amp. An a.c. low-voltage coil which also controls the d.c. circuit is incorporated as part of the switchboard equipment.

Telephone Equipment—The telephone board used at this substation for connection to the company's private system is of the standard dead front panel type which has been adopted for substation use by the Southern California Edison Company. An insulating transformer is provided so as to minimize the possibility of high voltage getting on the telephone equipment in the substation. Additional protection is provided by small telephone fuses and arresters. At this particular station no telephones are provided for connection to the public telephone system.

Electrical Ground System—Reference should be made to Fig. 8, showing the ground system used at this station. The system used here has been adopted as standard and, as may be seen, consists essentially of a network of copper conductors throughout the property and this network connected to a ground well. In addition copperweld pipes are driven at a number of points throughout the substation property and the ground network attached thereto. All water piping also is connected to this network. It may further be seen that the lightning-arrester equipment is provided with its own ground system of driven pipes which is in turn connected to the station network. It is felt that by this practice of installing a network, and of grounding all of the electrical equipment as well as the water piping to this network, the safest possible ground is established. The chances for this electrical ground remaining effective throughout the life of the station is greatly enhanced. It also should be mentioned that experience has shown that it is advisable to ground the steel towers to the network, as carried out at this particular station.

Alarm System—The alarm system used at this station consists of a combination of a special annunciator, developed by the engineering department of the Southern California Edison Company, and the standard type of red and green signal lights used on all switchboard installations. This annunciator consists essentially of standard relays which are used to control current to lights covered with clear glass lenses

Buildings

- (a) Brick building.
- (c) Five-room bungalow, and garage.

Miscellaneous

- (b) One exchange and one dispatcher's telephone, with extension in house.
- (c) 4/0 wire to water piping. Neutral to ground plate.
- (e) Emergency lights from 12-volt battery.
- (x) All circuits taken in from sub through iron pipe to poles.

Algoma Substation, The California Oregon Power Company, 60/2.3 kv.

By R. S. DANIELS

This substation was built to replace one that had become too small and that was in a poor location. The new station was placed in a more desirable location and the distribution circuits then cut over, causing an interruption of only short duration.

60 kv.

Structure: This is a wood structure with four 35-ft. treated poles set 5 ft. into the ground, supporting the necessary frame work on which is mounted one 66-kv., 200-amp., P.E.M. Co., type 1466 air-break switch with fuses, choke coils and ground gaps.

Transformer: Three 333-kva., 60-cycle, W.E.M. Co. 34.6-60 Y/2.3-kv., oil-cooled, outdoor type.

2.3 kv.

The 2.3-kv. equipment is all indoors.

Circuit Breakers: The three 2.3-kv. feeders are equipped with 400-amp., 4.5-kv., Westinghouse type F-11, full-automatic, remote-control, hand-operated oil circuit breakers mounted on pipe framework. The breakers control two power and one lighting circuit.

Disconnectors There are four sets of three disconnecting switches. One set of 600-amp., 7.5-kv. S.P.S.T. Westinghouse type S disconnecting switches between the transformers and switchboard bus and three sets of 400-amp. 7.5-kv. S.P.S.T. Westinghouse type S disconnecting switches between the bus and each oil circuit breaker.

Switchboard: The board of three black marine-finished slate panels, 16x65 in. with subbase 16x25-in., each panel having current transformers, ammeters, ammeter switch, etc. In addition there are three watt-hour meters with maximum-demand attachments, one recording the total output of the station and the others the output on each of the power feeders. Two potential transformers supply the watt-hour meters as well as one volt-meter.

Lines: All 2.3-kv. lines enter and leave the building overhead through 6.6-kv. wall bushings.

Buildings

The substation building is wood-frame covered with corrugated galvanized sheet iron. The size is 14x16 ft., with 9½-ft. walls. The floor is wood.

Miscellaneous

Fence: The station yard is fenced with 6-ft. woven-wire fencing having one 12-ft. driveway gate. The station is unattended.

Los Angeles Gas & Electric Corporation Substation No. 12

By F. E. DELLINGER

This substation is of a standard design, furnishing a.c. and d.c. in the downtown congested district. The building is 60x150 ft. and has three floors. The first floor has the transformers, motor-generator sets and d.c. feeder breakers. The second floor has the 2.4-kv. equipment and the third floor the transmission buses and circuit breakers. The control board and station auxiliaries also are on this floor. Circuit breakers are remote solenoid control and all circuits are underground.

16.5 kv.

- (a) Frame work is of pipe. Double-bus system with single circuit breakers.
- (b) Transformers: self-cooled, single-phase; in banks of 5,000 kva. High-tension for transformers is carried from third floor to first floor in concrete ducts which open through roof, providing ventilation for transformers.

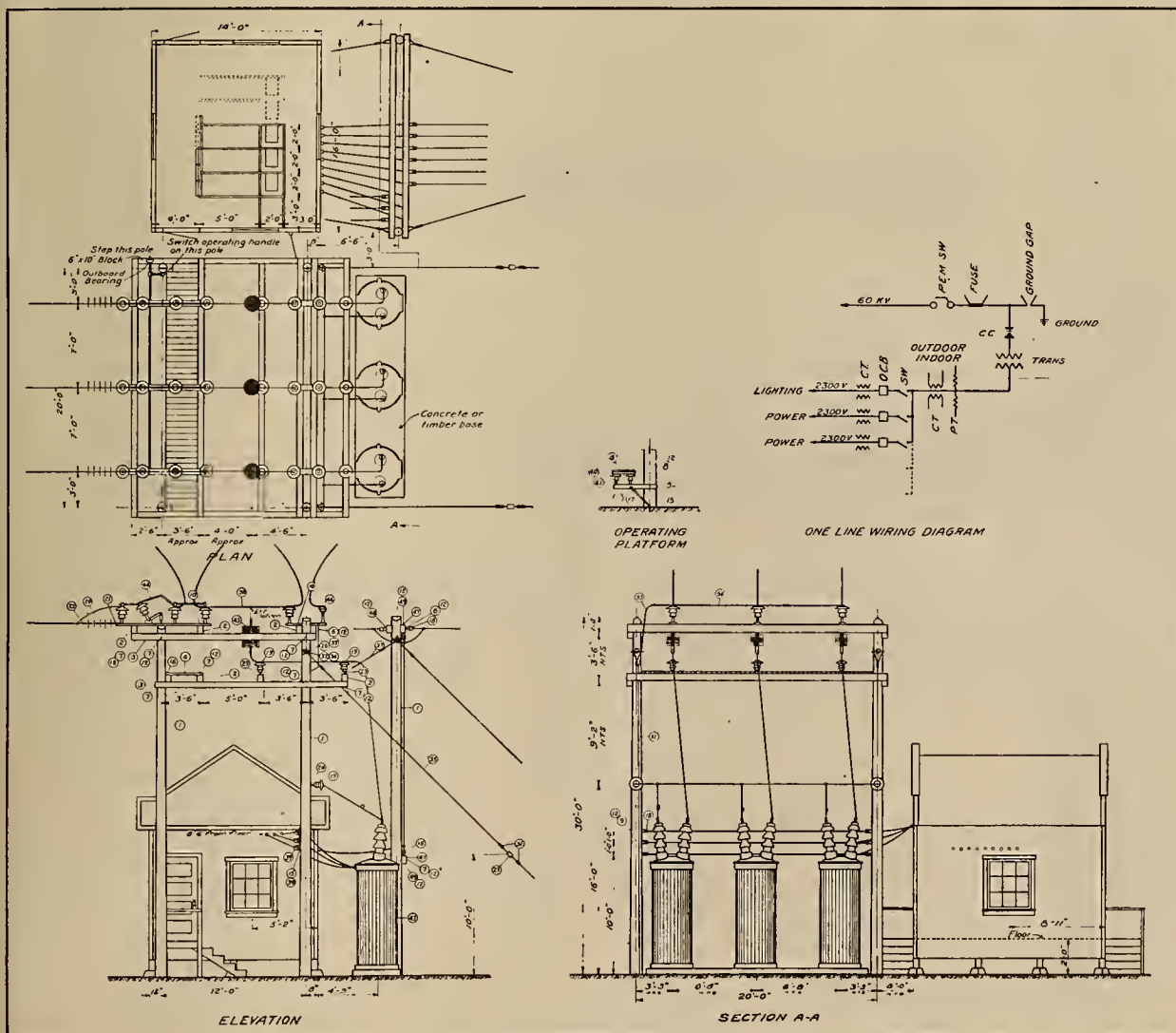


Fig. 1. Station details Algoma substation.

- (c) Circuit breakers in concrete cells are Kelman CB4, 400-amp., 33-kv.
- (d) Directional relays used on incoming high lines, and overload relays on outgoing high lines and transformer banks. Indoor oxide-film arresters used.
- (e) Ammeters and voltmeters are used on high lines. Each transformer bank has ammeter, voltmeter and wattmeter.
- (x) No automatic reclosing equipment used.

2.4-kv. Isolated Delta

- (a) Double bus through single breaker in concrete cell, and regulator. Emergency bus to which any circuit can be switched for work on regulators or breakers.
- (b) Two single-phase regulators on 3-phase circuit; 250-amp., 10 per cent buck or boost, automatic control.
- (d) Breakers: FK132A.
- (e) Plunger type relays; no arresters.
- (x) Ammeter and voltmeters on each circuit.

250-125-Volt d.c.

- (a) Double bus through single breakers.

- (b) M.G. sets; 1,000 kw. each.

- (c) Feeder breakers: SA1 or SA2, mounted on channel iron.
- (d) Motors have plunger-type relays for overload and no-voltage protection. Generators have overload and reverse-current, and no-voltage protection. Feeders have plunger-type overload relays.
- (e) Wattmeters on both motor and generators.

Buildings

Building is of reinforced concrete, brick and stone trim.
5-ton, man or oil hoist on third floor.
10-ton crane on second floor.

Miscellaneous

- (a) 240-amp.hr. lead battery with 7-kw. M.G. set. Trickle charging is used.
- (b) One regular exchange telephone and one dispatcher's phone.
- (c) Water piping.
- (e) Emergency lights burning all night from battery.
- (h) Tetro chloride extinguisher.

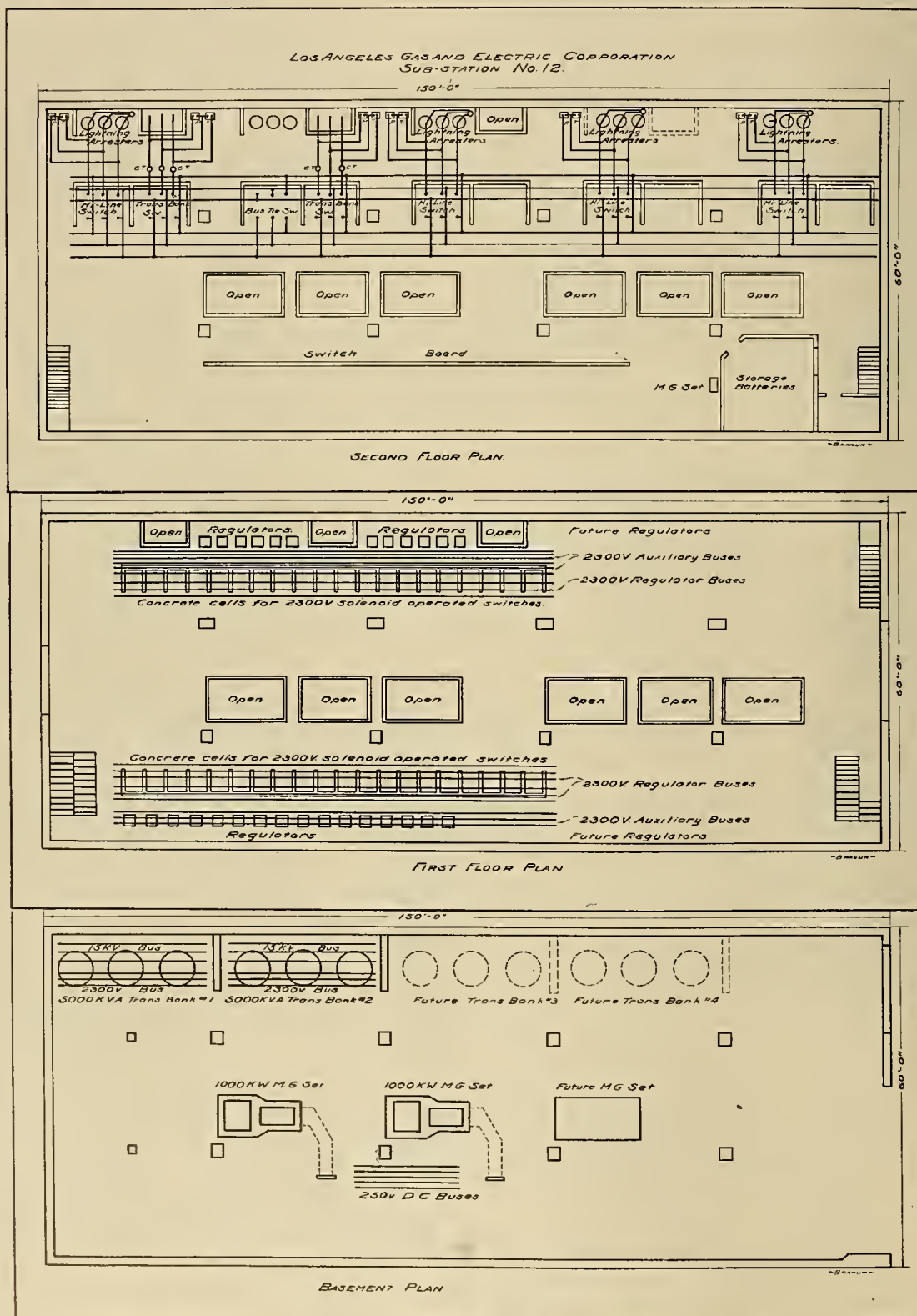


Fig. 1. Floor plans substation No. 12, Los Angeles Gas & Electric Corporation.

Relays and Relay Applications*

Specific instructions received by the relay subcommittee were to watch for, investigate and report all new or unusual applications of protective relays on the Pacific Coast. This assignment was considered to be sufficient inasmuch as existing practices of Pacific Coast companies in respect to relay application have been brought up to date in previous yearly reports of this committee. The report of the committee therefore consists of the three papers following.

Application of CV Low-Voltage Relays on the Southern California Edison System

By E. R. STAUFFACHER

As a means of isolating a certain portion of the system of the Southern California Edison Company at the time of system disturbances, use has been made of CV relays at certain strategic points with considerable success up to this time. While system disturbances are comparatively rare on the system of the Southern California Edison Company certain of these disturbances would have affected the whole system provided there was no means of isolating the above-mentioned section. This specific portion is the San Bernardino-Redlands district. Generating capacity in that territory and the load demand are so bal-

alone automatically the load demand of the Redlands substation and the Yucaipa substation. The power plants Santa Ana River 1 and 2 are so connected as to handle the 2.3-kv. load out of San Bernardino substation and the total load out of the Highlands substation at the time of system trouble.

CV relays are installed to operate switch 12 at Colton substation and switch 5 at San Bernardino substation. It may be noted that switch 12 referred to connects the Colton substation and Redlands substation together by means of a 30-kv. line, whereas switch 5 at San Bernardino substation is one of the transformer switches connected to the double 30-kv. bus at San Bernardino. Under conditions of normal operation switch 12 at Colton and switch 14 at Santa Ana River 3 power house, are both closed, while switch 13 is open at Santa Ana River 3. At the time of a system disturbance then, from the standpoint of the Redlands and Yucaipa load, switch 12 will open by the action of a CV relay, leaving that portion of the system isolated from the remainder and carried by the power houses already referred to.

In the case of San Bernardino substation, under normal operating conditions switches 1, 3, 4, 5, 9, and 10 are closed, leaving switches 2, 6, 7, 8 and 11 all open at this substation.

At the time of system trouble switch 5 at San Bernardino is opened by means of a CV relay, leaving the 2.3-kv. load, amounting to approximately 3,000 kva., to be handled by Santa Ana River 1 and 2 power houses. In addition to that load the load out of Highlands substation, consisting of approximately 1,500 kva., also is carried at times of trouble by these plants.

This scheme has worked out quite satisfactorily and has had occasion to operate several times in the case of Colton substation and one time in the case of the San Bernardino substation. It must be understood that these CV relays are used in addition to the usual overload and directional protection ordinarily provided in a transmission network.

Operating Characteristics of Reverse Power Relays

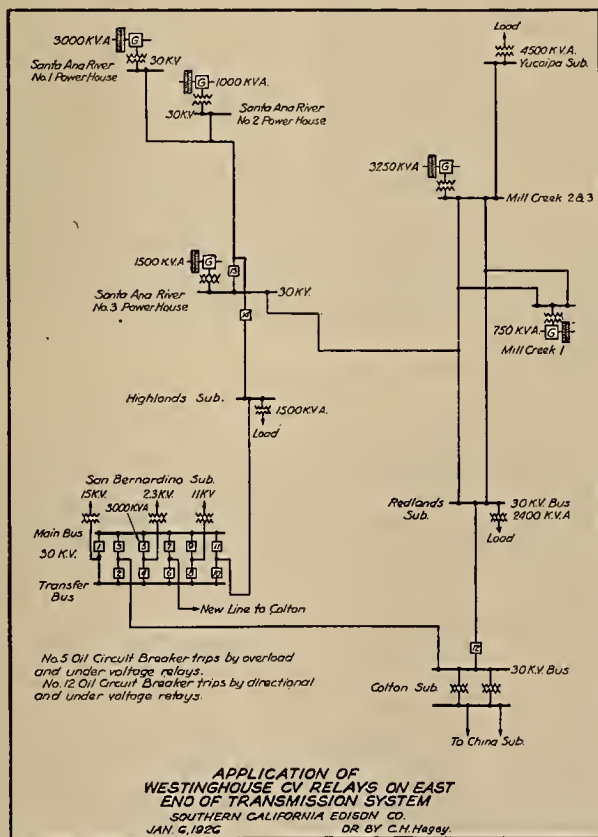
By F. J. LAWSON

As has been previously reported the Pacific Gas and Electric Company has been using reverse-power relays for a number of years on all its major transmission lines. While the operation of these relays has on the whole been quite satisfactory there are some places on the system where the characteristics of the relays are such as to handicap their use. The places referred to are some of the primary or high-tension substations which are so located that their outgoing feeders and tie lines of 60 kv. or 100 kv. are of considerable length before reaching the distributing substations. At these points conditions are such that under more or less normal operation the power-factor angle in the tie lines or feeders sometimes varies from nearly 90 deg. leading to 90 deg. lagging. These are conditions that the existing forms of reverse-power relays do not meet with entire satisfaction.

To determine the characteristics and limitations of some of these relays tests were made in the Pacific Gas and Electric Company laboratory on a General Electric type IB-1 relay and on a Westinghouse type CR relay, the results of which are described in this report.

The principal difference between these two relays is that the IB has a resistor in series with the potential coil that produces a phase displacement in the current through the potential coil of about 40 deg. over that obtaining in the Westinghouse element, or in the General Electric element with resistor removed.

The effect of this resistor on the operation of the watt-element is shown in Fig. 1 where OI is the vector of line current in the current coil and oi (not to scale) is the vector of current in the potential coil with the space displacement of 90 deg., which is the position at which the two currents have the maximum torque-producing effect. If we consider the potential coil current as remaining in phase with ϕ the voltage vector takes the position OA (with no resistance in



Schematic diagram of the eastern end of the system of the Southern California Edison Company showing points of application of selective separation.

anced that after such isolation the section can operate as a separate generating, transmitting and distributing unit for a comparatively short period, such as from one-half to one hour.

Fig. 1 shows the system set-up on the east end of the transmission system. From it may be seen that the relay set-up is such that the hydro plants, Mill Creek No. 1 and Mill Creek No. 2 and No. 3, and Santa Ana River No. 3 are arranged to handle

* Report of the Relay subcommittee of the Electrical Apparatus Committee: Roy Wilkins, Pacific Gas and Electric Company, chairman; C. F. Benham, Great Western Power Company; H. H. Cox, L. A. Bureau of Power & Light; R. C. Denny, San Joaquin Light & Power Corporation; J. N. Keith, The Southern Sierras Power Company; H. S. Lane, Pacific Gas and Electric Company; H. L. Sampson, Southern California Edison Company; E. D. Sherwin, San Diego Consolidated Gas & Electric Company; E. R. Stauffacher, Southern California Edison Company.

series); OA being made up of the IR component OA' and the IX component A'A. Thus the angular position of OA and OI for maximum torque is with the current I leading the voltage by 7 deg.

With a resistor of 250 ohms in series with the potential coil and the same applied voltage of 110 volts the voltage vector takes the position OB, the angle

maximum torque when the power-factor angle reaches 40 deg. lagging.

The Westinghouse company supplies its relay without series resistance, recommending a 30 deg. displacement between current and potential. This makes the relay develop maximum torque at approximately a 20 deg. angle, corresponding to a power factor of 0.93.

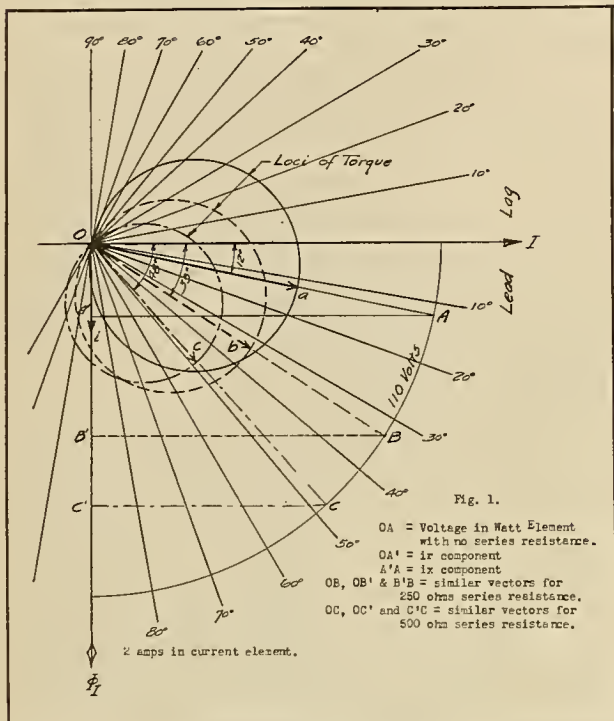


Fig. 1. Torque characteristics of watt-element of Westinghouse type CR relay.

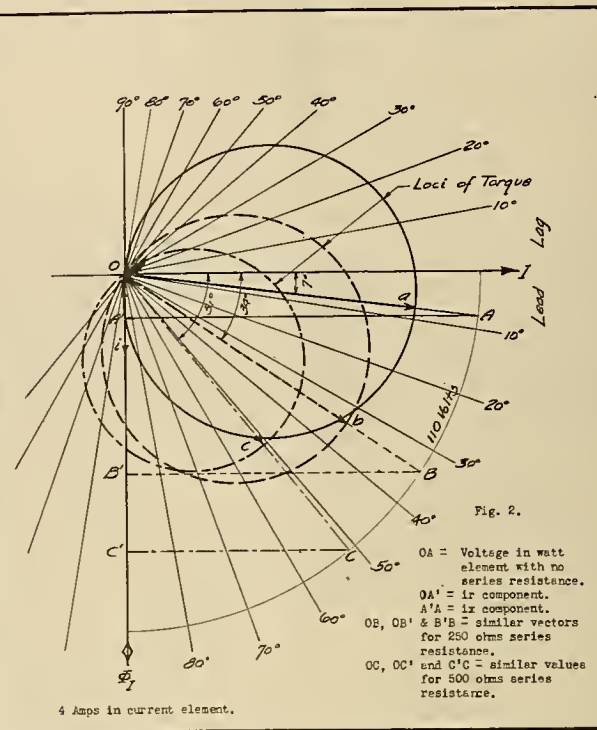


Fig. 2. Torque characteristics of General Electric type IB-1 relay.

between current and voltage for maximum torque being 34 deg. With 500 ohms series resistance the voltage is OC and the angle is 51 deg. current leading.

A similar diagram for the Westinghouse type CR relay is shown in Fig. 2.

If we plot the torque on the disk for varying power factors we find that the locus of the torque vector follows a circle which has its diameter on the vector of voltage. This, of course, is to be expected from the construction of the diagram since the torque is proportional to the cosine of the angle between the currents producing it. The torque circles shown were plotted from test data in which the torque was measured as the reciprocal of the time required for the disk to make a complete revolution; the contact and controlling spring having been removed previously. The decreasing size of the circles for higher series resistance is due, of course, to the decreasing current in the coil.

Limits of power factor within which the relay will reverse satisfactorily upon reversal of current are from about 60 deg. or 70 deg. on either side of the angle of maximum torque, giving a range of from 120 deg. to 140 deg. Beyond these limits the torque is too weak to be dependable and is reduced further in direct proportion to the drop in voltage. From the diagram it is obvious that the relay can be made to develop its maximum torque over quite a range of power factors by changing the value of the series resistance or by selecting currents and voltages at from 30 deg. to 90 deg. phase angles from delta-Y transformations, depending on what the probable power factor condition is at the time the relay is required to operate.

The General Electric Company in supplying its relay with the high value of series resistance recommends that they be so connected that at unity power factor the current will be 90 deg. ahead of the voltage. Under this condition the relay will develop

This company has found on its system that faster and more reliable relaying results with an in-phase connection of current and voltage. Hence this connection now is used on all its installations, but an attempt is being made for the locations mentioned where the power factor varies so widely, to develop a relay which will produce a torque less dependent upon power factor.

Protective Relay Practice of the San Joaquin Light & Power Corporation

By R. C. DENNY

Protective relays on any extensive transmission system play fully as important a part in the rendition of continuous, satisfactory service as any other class of apparatus on the system. Being automatic and selective they are infinitely quicker and more accurate than the average good operator. Moreover, they require little or no attention on the part of the operator while much of the ordinary station apparatus requires considerable attention. The automatic relay therefore is a great boon to the operator as it relieves him of the worry of outside troubles over which he has no control and allows him to concentrate on the station apparatus of which he does have control. It is not to be inferred from the foregoing that the relays do not require any attention. However the attention is more of a supervisory nature than of actual mechanical adjustments.

Obviously the proper selective action of relays on an interconnected transmission network depends largely on the proper current and time settings, but is somewhat influenced by changes in the power sources that sometimes occur incidental to seasonal operation of plants. The one-line map, Fig. 1, shows such a system and its various sources of power. In the 40 substations and plants of this system there are 95

transmission switches that are automatic and practically all equipped with bushing-type current transformers which operate induction-type relays. It readily may be seen that this system is composed of some 10 interconnected loops. These are normally operated

all together to give greater system stability and provide two or more sources of power for most of the substations.

In order that the relays shall have the proper current and time settings to function selectively and without causing unnecessary interruptions it is necessary to make a co-ordinated study of the system short circuit characteristics. This probably is best accomplished by ascertaining the reactance (ohms) values of all generators, station transformers and transmission lines as referred to some common voltage basis and then building up a miniature low-voltage system using resistance units of value proportional to those of the various line sections and generating units. System short-circuits may be simulated on this miniature system, the currents measured, the kva. calculated to within close approximation of actual system values and the relays set accordingly. Such miniature systems are commonly known as calculating boards or tables and one of these has been in service on the San Joaquin system for well over a year.

There is shown in Fig. 2 a family of decrement curves for such a system as that of the San Joaquin Light & Power Corporation, which has an average system reactance of 62 per cent. The curves shown are for 3-phase short-circuits. For single-phase shorts the current values are approximately 1½ times as high while for grounds they are about 2½ times, the grounded neutral connection being employed the system over. Owing to the fact that most of the line troubles are grounds or single-phase and that the current value drops off so rapidly for short delays it is necessary to resort to rather high current settings and comparatively low time settings, tapering both to get selectivity between stations.

All of the loop substations and plants have their switches equipped with the standard CR directional, overload relays connected to trip the switches for excess current in the outgoing direction in all cases; that is, away from the station bus. With reference to phase relations the relays are connected so that under normal operation and power-factor conditions the current in each relay leads the potential by 30 deg. This is recommended by the manufacturer and is found to be quite satisfactory. The potential for the relays is taken from star-connected metering transformers on the station secondary or distribution bus, employing

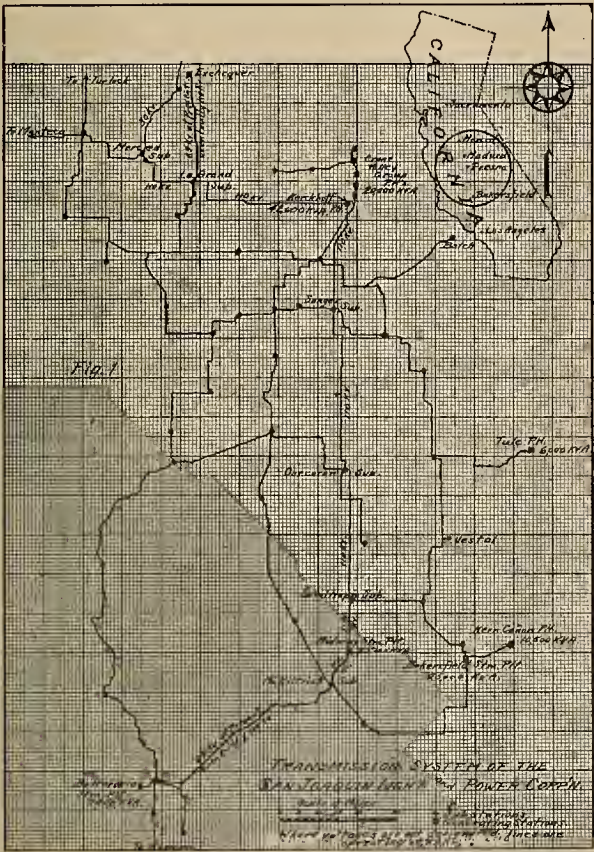


Fig. 1. Transmission system of the San Joaquin Light & Power Corporation. Where voltages are not designated, lines are operating at 69 kv.

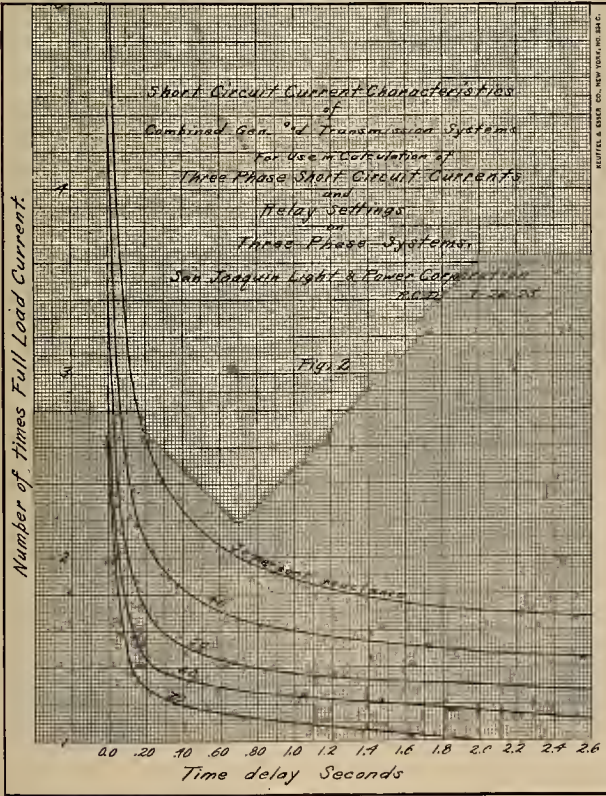


Fig. 2. Short-circuit characteristics of combined system, San Joaquin Light & Power Corporation.

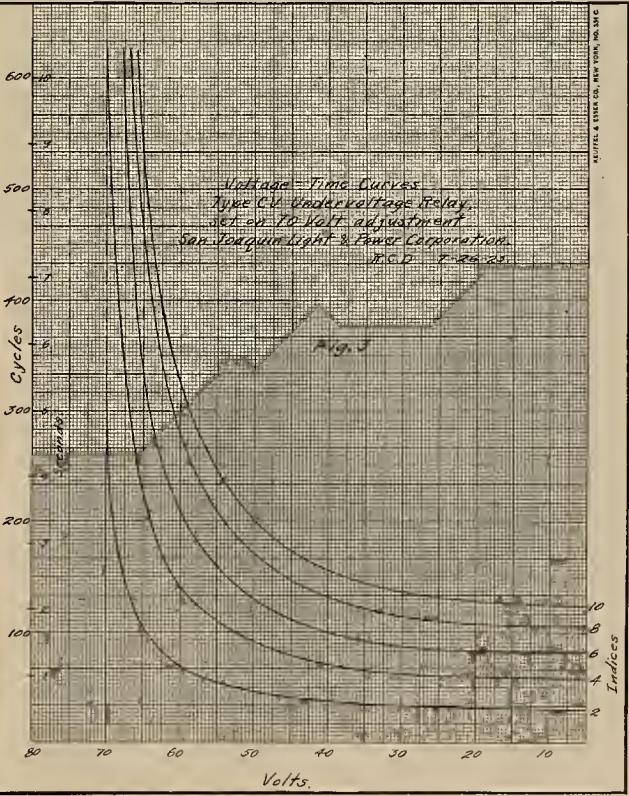


Fig. 3. Voltage-time curves of CV undervoltage relays on San Joaquin Light & Power System.

half taps in a delta connection to get the right voltage and necessary phase shift for the relays, the current being taken from star-connected bushing-type current transformers.

As inferred in a preceding paragraph the selective operation of the CR relays on grounds and single phase troubles is highly satisfactory. Time after time the bad section of line is dropped from service with only a momentary dip in voltage and very little effect on the system as a whole. For 3-phase shorts, however, the action is not so good. The relays show an appreciable drag even on the 60-kv. system where the current is greater for any given kva. Even worse action has been experienced on the 110-kv. system when the relays have not worked at all on the few occasions of 3-phase shorts. It will be evident from Fig. 1 that the 110-kv. line really is the backbone of the system extending eventually to the Coast. Obviously then, this should be the most reliable line of the system from all standpoints and 3-phase shorts occurring on this line, seldom as they do, should not be allowed to demoralize the entire system.

Inasmuch as the current falls so rapidly to low values on 3-phase shorts, as is evident from the 60-

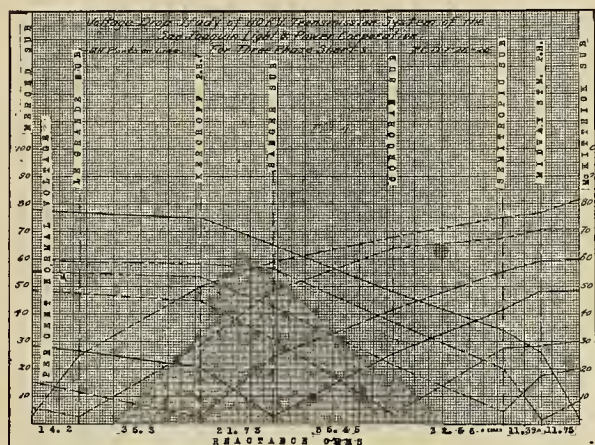


Fig. 4. Voltage-drop study of the 110-kv. transmission system of the San Joaquin Light & Power Corporation.

per cent reactance curve in Fig. 2, it is no great wonder that the 110-kv. system relays do not get enough current to operate. Recognizing the voltage drop on such occasions as offering a possibility for the application of a relay to operate irrespective of current values an investigation was made of the characteristics of the CV under-voltage relay. This is a standard induction-type relay much resembling the better known CO relay, but having a potential winding instead of a current winding. By means of an induction regulator and cycle counter the curves of Fig. 3 were derived. The inverse time characteristics are very similar to those of the overload relays and are all that could be desired. Different voltage adjustments have little or no effect on the shape of the curves, merely shifting them one way or the other along the horizontal axis.

In order to arrive at the proper voltage and time adjustments of the CV relays at the points of application on the 110-kv. system a study was made of the voltage-drop situation for 3-phase shorts at the various points. This is presented graphically in Fig. 4, giving the voltage drop as a percentage of normal. This is done on account of the varying transmission bus voltages at the stations concerned and the impossibility of maintaining a uniform transmission voltage level. This study was made on the system calculating board and checks very closely with actual results as observed at several stations during 3-phase shorts. It has been found through a correlation of the results of these studies that by using the proper voltage and time adjustments on the standard CV relays it is possible to get about 40 cycles' time between stations with a minimum definite time of 2 sec., which is manifestly better than no operation at all.

Thus it is possible to get selective inverse time protection against 3-phase shorts without a current-actuated element. The scheme would be of little value in a loop system without the directional feature. This is secured by combining the CV relay with the existing CR relays in such a manner that the trip-circuit contact of the CV relay shunts the current-actuated contact of the CR relay. Thus the CV contact is in series with the directional-element contact of the latter. This is done as shown in Fig. 5 where an extra stud is brought out on the CR relays connected as shown. An auxiliary relay is used to keep the special connections on the CR relays separated until the CV actually operates. This is to prevent improper operations that might occur during grounds or single-phase troubles where one relay of the opposite set of CR's would close its overload contact while the directional contacts of the other two relays of the same set were closed for normal power flow in the opposite direction which would result in the wrong switch tripping.

It may even happen that a CV relay down the line may function on a single-phase or 3-phase short several line sections away, however, so as not to trip its switch owing to the direction being wrong. This will be made apparent to the operator through the operation-indicator target on the CV relay, and he will immediately reset the auxiliary relay, no harm being done at all. If some other ground or single-phase short should occur while this condition existed there still would be the usual CR protection. It may be noticed that only one potential transformer is necessary, all CV relays at one station being connected to the same transformer. Inasmuch as the scheme is for 3-phase short-circuit protection under which conditions all phase voltages collapse similarly it makes no difference which phase of the station bus this potential is connected to. In fact the existing synchronizing transformers are used to save additional expense. If the CV relay functions for single-phase trouble on the particular phase to which it is connected, it tends only to assist the CR relay in getting the line out. This is not objectionable.

It will be apparent, therefore, that such a scheme in itself gives adequate protection against 3-phase shorts and at only slight additional cost over the CR installations, providing that line synchronizing potential transformers are in service, which they usually are. While 3-phase shorts may occur rather infre-

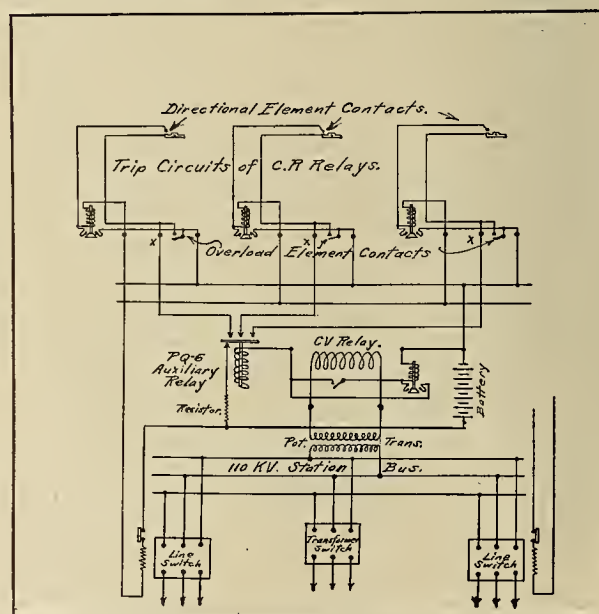


Fig. 5. Connections for combining CV relays with CR installations; "x" stands for extra terminal connection.

quently it is believed that the protection afforded by the scheme outlined is a good, cheap insurance against shut-downs and therefore is entirely justified.

Operating Experience with Oil Circuit Breakers*

In order that the findings of this subcommittee might be of as much practical value as possible the work was directed along the line of actual operating experiences. In the past there has been much said pro and con about the oil-switch situation from the standpoint of both manufacturer and operator. If the operator has not known his circuit breaker needs, then this fact alone is good and sufficient reason for the existence of such a subcommittee and for its aims. It is the purpose among the 12 operating companies comprising the membership of this subcommittee to analyze all transmission oil-circuit breaker operations, particularly from the standpoint of rupturing duty and to keep a record of same. In this way the performance of switches may be compared between systems and a more nearly satisfactory performance rating established. In order that the procedure be uniform the committee members last year agreed upon the information desirable for such study and a tentative report form was drafted. This since has been adopted in substance by the operating companies of the P.C.E.A.

Manufacturers' Ultimatum

Coincident with the activities of the operating companies along the line of oil-circuit breaker investigations comes the ultimatum of the manufacturers as set forth in the Electric Power Club Rule 10,692: "Manufacturers' published ratings of oil-circuit breakers are not guaranteed because these ratings presuppose that the oil-circuit breaker has been properly installed and maintained and that it is in efficient operating condition at the time of the circuit interruption; particularly as regards contacts, oil and mechanism, and those conditions are outside the control of the manu-

factory breaker operations and the practice of inspection and maintenance.

It is somewhat interesting to note from the breaker data submitted that the pioneer companies of the P.C.E.A. have on their systems a preponderance of locally built breakers. In fact one company has manufactured many of its own breakers. This might be expected, owing to distance from eastern manufacturing centers. It is very gratifying, however, to find that Pacific Coast circuit-breaker manufacturers are coming

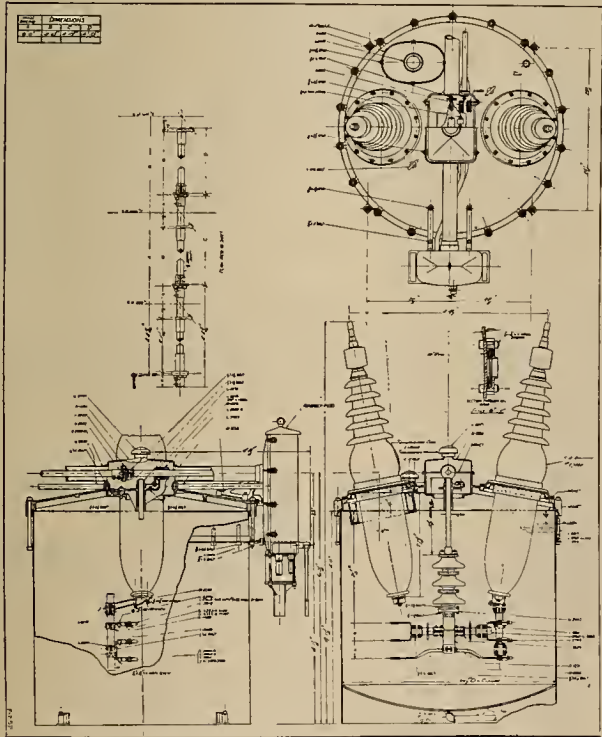


Fig. 1. Pacific Electric 110-kv. breaker, a typical design.

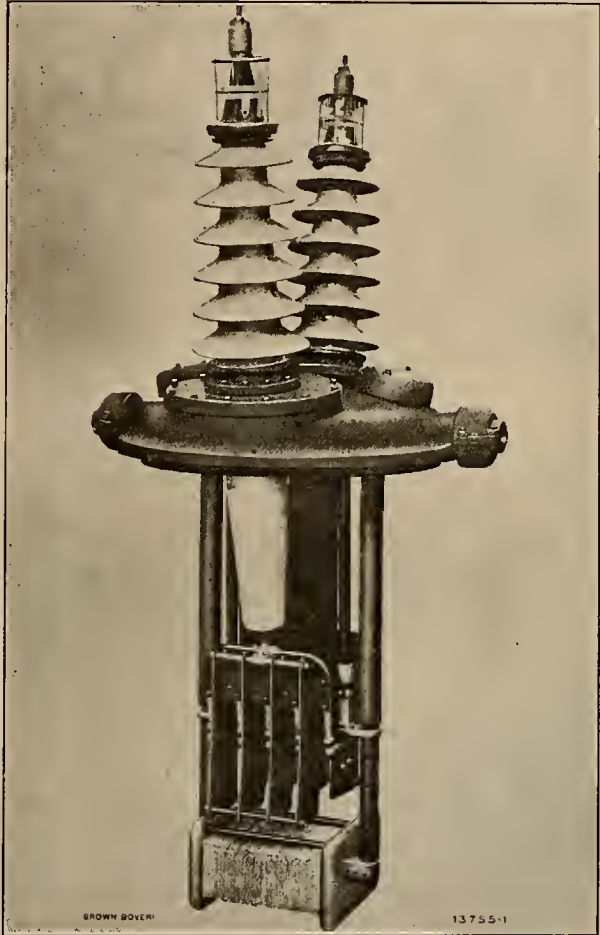


Fig. 2. Brown-Boveri 110-kv., 350-amp., single-pole breaker with tank removed.

to the front and keeping pace with the advancement of the art. Standard 70-kv. and 110-kv. circuit breakers of the Kelman Electric Manufacturing Company of Los Angeles and the Pacific Electric Manufacturing Company of San Francisco are shown in illustrations accompanying this report. Both of these manufacturers seem rather in agreement that rupturing capacity is properly increased by additional breaks in series while each has a different method of obtaining that result. The Brown Boveri Company manufactures a breaker rather on the same order. However, at the present time none of them are in use among the P.C.E.A. companies while the Kelman and P.E.M. breakers are fairly well represented.

Other breakers mentioned in this report and in use on Pacific Coast systems are the well-known designs of the Westinghouse Electric & Manufacturing Company and the General Electric Company. Both of these manufacturers adhere to the 2-break and resort to the quick-break arcing contact and the explosion chamber respectively to gain rupturing capacity. It is evident therefore that there is some difference of opinion among the manufacturers as to the proper method of gaining rupturing capacity. However, from the operators' viewpoint it is felt that the rupturing capacity of circuit breakers is dependent upon some five essential features of design, whatever the arrangement. These are

A For interruption of arc: Contact break distance; speed of contact travel; contact pressure; magnetic blow out effect.

* Report of Subcommittee. R. C. Denny, chairman. K. B. Ayres, C. F. Benham, H. H. Cox, R. S. Daniels, F. R. Knight, H. A. Laidlaw, C. C. Long, P. J. Ost, E. D. Sherwin, T. W. Snell, E. R. Stauffacher, W. R. Van Bokkelen, P. H. Yelton.

B For absorption of energy of arc: Volume of oil; oil head above contacts; air space above oil; venting.

C Mechanical strength: Strength required throughout to withstand the strains due both to pressures developed by release of gas and to electromagnetic effects of the heavy currents handled.

D Thermal capacity: All current-carrying parts must have sufficient thermal capacity to carry the maximum currents while they last.

E Oil quality

Meeting Operating Requirements

These requirements may be met satisfactorily in any make of switch if it is properly designed. It would seem therefore to be largely a question of the operating experience of the designer. This is yet another reason why the findings of an operating committee on circuit breakers could be of considerable value. In fact it is gratifying to note that during the current year there are improvements being made in several different makes of breakers that may be traced directly to the efforts of operating companies, members of the oil circuit-breaker subcommittee. The oil circuit breaker, subject as it is to extraordinary strains and blows, may easily get out of adjustment unless the design be simple and sturdy. If these misadjustments occur inside the breaker and especially if under the oil they may easily escape notice and may eventually lead to trouble. In fact such minor defects have led indirectly to switch failures which inadvertently have been attributed to failure to rupture, whereas the only good reason for failure to rupture is that the breaker is too small for the job. If breakers are to be properly maintained the inside mechanisms must be made fairly easily accessible.

Outside mechanisms are responsible for a share of the breaker troubles and while of a minor nature they often are quite exasperating. The trigger work that controls the operating energy, the levers, springs, weights, and pallet switches, are some of the little things anyone of which out of adjustment may prevent or delay a proper breaker operation. The trip-free characteristic of transmission breakers is a very important feature as it has a bearing on the relay situation. Where transmission breakers have to be closed by hand and the operation thus slowed down it often happens in closing in on a bad line that some other breaker down the line is tripped before the one being operated has been entirely closed and set up for the opening operation. This sometimes happens even when breakers are closed by power and operate faster, and usually results in unnecessarily interrupting some other substation.

While there probably has been more said about and less done about oil than any other phase of the breaker situation the fact remains that some oils give better service than others in circuit breakers. Whether there is any "best" oil for circuit breakers is problematical; at least it is dependent upon operating conditions and climatic conditions particularly. Some oils vaporize, volatilize and decompose readily so their use in circuit breakers obviously would be unwise although they might serve fairly well in transformers. Several of the operating companies are using transformer oil in their circuit breakers, particularly the General Electric No. 10-C transil oil. Others are using only such oil as recommended by the breaker manufacturer. One of the foremost breaker manufacturers advocates the use of transformer oil in circuit breakers while another prominent manufacturer deprecates the practice. However, the latter manufacturer admits looking for an oil satisfactory for both purposes so the indications are good that the controversy may be short lived. Practically all the operating companies are content to accept their breaker oil on the agent's guarantee with no other test than that for dielectric strength. This seems rather unusual when one considers how exact the electrical engineers are in their specifications for the electrical apparatus intimately associated with oil.

Tests on oil as indicated by one of the N.E.L.A. questionnaires on the subject include the following items:

Specific gravity, 15.5/15.5 deg. C.
Flash test, deg. C. minimum.
Fire test, deg. C. minimum.
Pour test, deg. C. maximum.

Viscosity, seconds, indicate deg. C. maximum.
Demulsibility, c.c./hr. minimum.
Resistance to emulsification seconds maximum.
Moisture per cent maximum.
Sediment per cent maximum.
Turbidity.
Sulphur corrosion.
Sulphur per cent maximum.
Unsaturated hydrocarbons, per cent maximum.
Michie per cent maximum.
Evaporation per cent maximum.
Dielectric kv. minimum.
Color.

Duty Cycle

The subcommittee has not been particularly concerned with the reclosing duty-cycle for transmission circuit breakers. Operating practices vary so much in this regard that it would be practically impossible to hope to standardize on any uniform procedure. It develops that there is even some difference of opinion regarding the procedure of 3-phase short-circuit breaker tests. This, it might be said, resolves itself into the question of whether or not circuit breakers are actually bought on the basis of how much of a short they will close in on rather than how much of a short they will rupture. The closing duty is thought to be unnecessarily severe as the arcing tips and blades have to withstand the fusing effect of the initial short-circuit current, whereas no breaker can open quickly enough to break the initial short-circuit current.

Some operating companies have so far departed from the Electric Power Club's "2-OCO" duty cycle as to use other breakers to test lines instead of using the one originally clearing the short. There also are numerous cases where a breaker manufacturer has departed from the same duty cycle by closing 3-phase shorts with another breaker in series with the breaker under test. These exceptions uphold the old saying that there are exceptions to all rules. The selection of oil-circuit breakers and the practice of subjecting them to short-circuit tests should be based somewhat upon the average service that they will likely get; at any rate they should be tested at the point on the system where they are to be used. This is borne out by the relatively small percentage of breaker failures, probably not over two or three per cent per year on systems experiencing hundreds of trip-outs each year. Any company that follows the practice of testing all their breakers at their system power-center undoubtedly will pay for a much higher factor of safety than is necessary for many of their breakers which will result in an over investment in circuit breakers.

Several of the larger operating companies have submitted circuit breaker reports which are presented in their entirety following this paper. Many of the other companies have expressed the intention of vigorously pursuing the work in order that they may know their breaker needs.

Oil Circuit Breakers on System of Pacific Gas and Electric Company

The following is a summary of the high-tension oil circuit breakers in use on the system of the Pacific Gas & Electric Company, classified according to voltage and manufacture:

60 kv.—P.G.&E.	159
P.E.M. Co.	21
P.E.M. air and oil	15
Stanley	1
G.E.	17
Westinghouse	7
Kelman	2
N.C.P.	5
Total	227
110 kv.—P.G.&E.	7
P.E.M.	4
G.E.	36
Westinghouse	20
Total	67
220 kv.—Westinghouse	16
Total	310

P.G. and E. 60-kv. Switch

As will be noted the very large majority of 60-kv. breakers are of the company's own manufacture. All of these are of the horizontal 4-break type with the

exception of a very few 2-break switches of an older design. The majority of these breakers are solenoid operated, the solenoid mechanism also being of company design. Fig. 1 shows the assembly of a recent design of this switch of which there are a large number in use.

Within certain limits these switches function satisfactorily, with a normal amount of maintenance of arcing contacts and attention to the oil. However, tests that have been made indicate that the speed of operation should be improved and that the construction of the rotating element which consists of porcelain insulators litharged into a revolving shaft is not mechanically strong enough. There is a tendency for the litharged parts to loosen allowing the shaft to turn independently of the blade assembly. In some cases the blade assembly has dropped to the bottom of the tank.

This trouble is believed to be caused to a considerable extent by the jarring of the rotating element when the contacts close, due to the bottoming of the

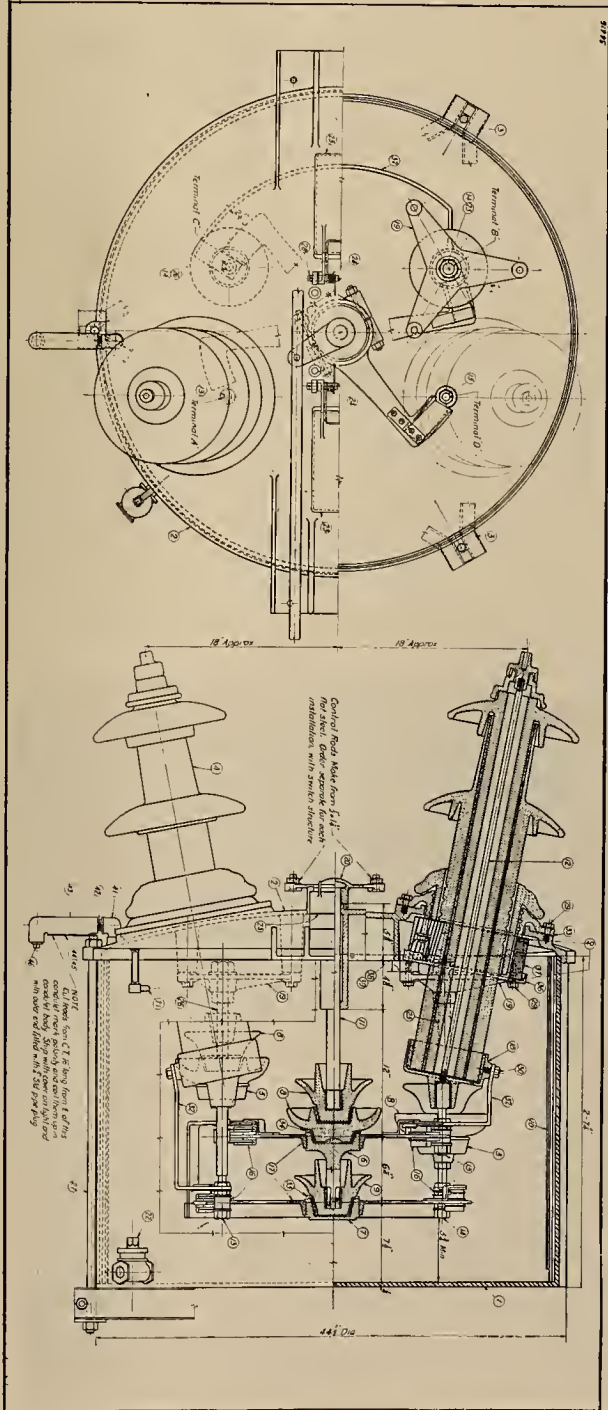


Fig. 1. A common design of circuit breaker as manufactured by the Pacific Gas and Electric Company

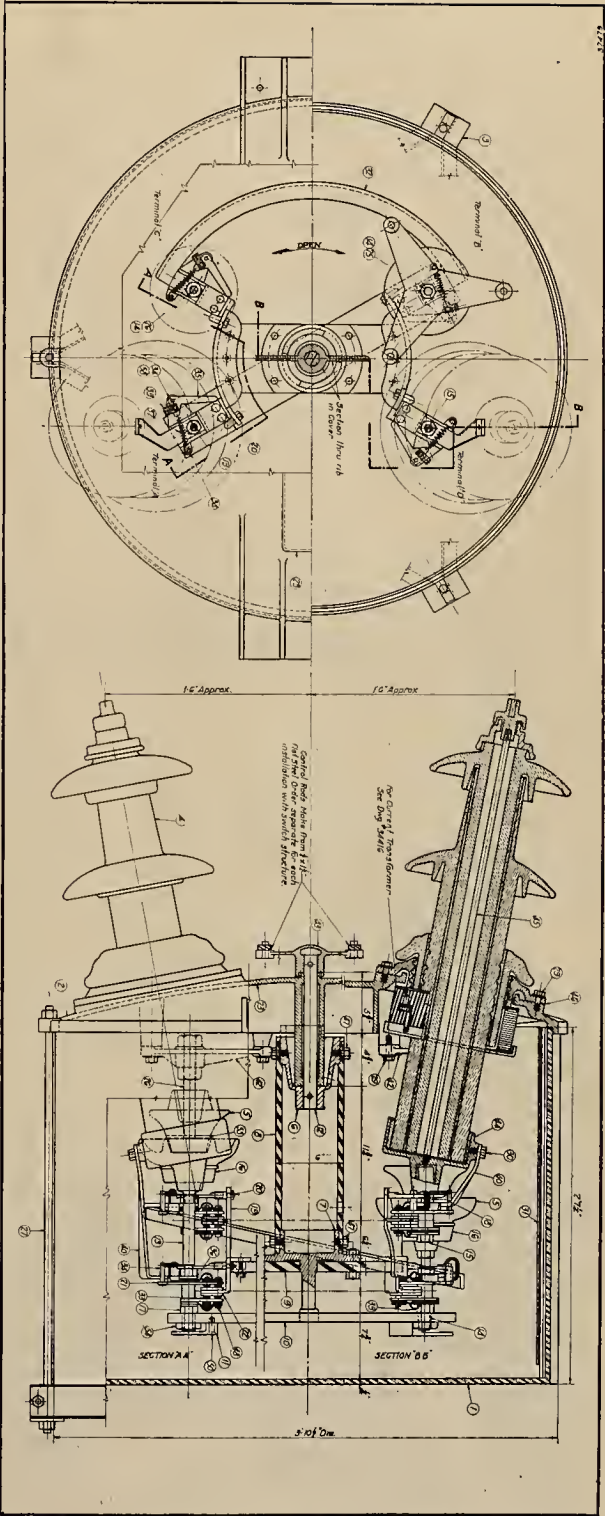


Fig. 2. A later design of the Pacific Gas and Electric Company circuit breaker.

plunger in the solenoid and to the inertia of the relatively heavy revolving parts. The construction is such that unless extreme care is taken in adjusting the central gear the revolving blade may pass through the stationary clips far enough to strike the stud supporting the same. This not only tends to lessen the revolving parts, but also to damage the bushing and destroy the alignment of the stationary contacts.

The bearing of the revolving element is carried in the top of the switch tank and is necessarily rather short. A small amount of lost motion in this bearing allows the lower end of the revolving shaft, carrying the moving blades, sufficient play that the blades cannot enter squarely into the contacts. The arcing tip projects some distance beyond the main contacts and is of more or less rigid construction so that

The arrangement of the main contacts still adheres to the horizontal 4-break scheme, but the contacts themselves are so designed that the blades can pass entirely through the contacts without striking the studs holding them.

An external stop for the mechanism is provided so that the blades normally will rest in the center of the stationary contacts when the switch is closed. The porcelain revolving element insulation has been replaced by a heavy Bakelite tube. A lower bearing provided for the revolving part also effected much sturdier construction.

Type W Switch Operator

A new spring-type operating mechanism, known as the type W operator, has been designed and constructed to replace the solenoid operator formerly used. An assembly drawing of this operator is shown in Fig. 3. In this operating mechanism springs under tension actuate the switch both in the opening and in the closing strokes. After the switch has been tripped a motor automatically winds up and latches both

During initial tests made in the shop on this operator connected to one of the new-type switches described above, the combination was operated 7,000 times. At the end of that time no replacements of any sort or any major adjustments were necessary either in the switch or in the operator. Fig. 4 shows different views taken during these tests. The operator is shown (A) with both springs cocked, the switch being in the open position; in (B) the switch has been closed, and in (C) it has been tripped. A comparative idea of the size of the operator is given in (D). Under actual operating conditions no failures of this mechanism have occurred to date.

The speed of operation with the operator now in use is the same as with the solenoid formerly standardized upon. This is about twice the speed of operation of any gravity-operated switch. With the spring operator the speed can be increased by stiffening the spring.

Patents have been applied for on this device and negotiations for the right to manufacture it for general use are now being carried on with one of the Pacific Coast manufacturers.

Operating Experience

This company has instituted the use of the form shown in Fig. 5 for the purpose of keeping a record of operation of all high-tension oil circuit breakers at a number of selected substations. The use of this form has not been adopted at all of the substations on the system and it has been in use only about four months. Hence the data so far collected is not very complete.

However, Table I gives a summary of the results so far obtained by the use of this form, listing the total number of switches under observation, the number of satisfactory and unsatisfactory operations and the estimated maximum current satisfactorily interrupted. It is only fair to say that the two circuit breakers which did not operate satisfactorily were of an old and obsolete design that has not been manufactured for a number of years. They gradually are being replaced by a later type of switch.

OIL SWITCH OPERATING RECORD

Operating Company

Switch Location

Company No. or Designation

Manufacturer's Name

Rated Voltage

Rated Current Capacity—Carrying

Type of Switch—Automatic

Nature of Overload—Ground

Approximate Current Interrupted

No. of Automatic Openings since Last Overhaul

Date

Time

A. M.

P. M.

Circuit Voltage

No.

Oil Used

Rupturing

Non Automatic

No. of Breaks

Single Phase

Three Phase

Findings—

Phase A

Phase B

Phase C

External

Bushings

Tops

Tanks

Oil Spillage or Leakage

Internal

Bushings

Blades

Contacts

Oil dirty, wet or carbonized

Was Opening Satisfactory

General Remarks

Fig. 5. Operating record form kept by Pacific Gas and Electric Company.

springs, taking about 7 sec. to perform this operation. As only a small motor is required to perform this duty the mechanism may be operated from a 24-volt storage battery, eliminating the necessity for a large battery with its attendant high initial cost and maintenance expense.

By increasing the size of the motor larger switches may be operated; plans are under way to operate 110-kv. oil circuit breakers by this method. The speed with which it is desired to reclose the breaker after it is open or, in other words, the time required to place the springs under tension governs the size of the motors used. The speed at which the breaker is operated is governed by the stiffness of the springs. In the standard operator, a ¼-hp. motor is used, requiring approximately 7 sec. to place the springs again under tension after the switch has tripped, as stated above.

Inasmuch as there are separate springs for the opening and closing function the breaker always is in a position to trip immediately after it has been closed. The mechanism is designed on a toggle principle so that the switch is locked in both the open and closed positions and the travel is definitely fixed by the straightening of these toggles.

Pacific Gas and Electric Company Switch-Record Summary									
	60 K.V.		Mfr. P	110 K.V.		Mfr. W	220 K.V.		Mfr. W
	P.G. & E.	Mfr. G		Mfr. G	Mfr. W		Mfr. G	Mfr. W	
Number of switches under observation.....	87	11	10	23	14	16			
Satisfactory operations.....	64	10	1	8	8	20			
Unsatisfactory operations.....	2	0	0	0	0	0			
Maximum Current Satisfactorily interrupted.....	3200	4000	910	1700	1600	525			

Following are some of the difficulties which have been experienced in the operation of oil circuit breakers of types other than already described in the foregoing.

In the explosion-chamber type of breaker manufactured by one large company the removal of the fiber insulating tubes surrounding the explosion chamber and the removal of the bottom of the chamber is necessary in order that the stationary contacts may be removed for proper inspection. This means that the oil must be entirely removed from the switch and considerable preliminary work done before an inspection of the contacts can be made. The bridging of lamps across the bushings is not a good check on the condition of the contacts as the movable contact rods may bear heavily on one side of the stationary contacts due to slight misalignment. This would permit the three phases to close simultaneously, but would allow a severe burning of the sides of the arcing tips due to their making contact on only one side. The lamp method of inspection will give no indication of this condition and it is believed that actual visual inspection of the contacts is necessary at regular periods. This is made more costly than seems warranted, because of the amount of preliminary work necessary.

There is no trip-free feature provided in the control mechanism of this breaker, which is a serious fault. If the auxiliary closing relay fails to open through welding of the contacts or for any other reason, if the closing button be held after the switch

is closed, or if the closing circuit remain energized for any other reason the breaker will not trip even though the trip circuit is closed by the relays. In practically all other breakers a trip-free feature is provided in the mechanism itself so that in case a switch is closed on trouble it will trip out immediately even though the closing solenoid remains energized.

Other difficulties which have been experienced with this type of breaker have been heavy carbonizing of oil in the explosion chambers and the misalignment of the moving contacts due to warping of the wooden parts in the moving contact assembly. This latter is practically impossible to prevent. Trouble of this sort can be prevented only by rigid and frequent inspection.

With the butt-contact type of circuit breaker manufactured by another large concern the principal difficulties experienced have been due to failure of the quick-break mechanism to latch and the difficulty of maintaining an adjustment which will allow all latches to disengage properly and simultaneously. Failure of the latching mechanism to operate properly is due not directly to the interruption of large currents but is inherent in the design and caused by loss of adjustment due to mechanical operation of the breaker. Periodic test of the quick-break latches is necessary if the breaker is to be maintained properly.

Failure of the quick-break mechanism to latch has been caused by the butt contacts of the arcing mechanism backing off and has been remedied by drilling through the cap screws which form these butt contacts and inserting pins. Backing out of the studs used as main butt contacts also has been experienced and this trouble remedied in the same manner. This is not entirely satisfactory as difficulty is experienced when it is found necessary to replace the contacts with new ones. Loss of adjustment elsewhere in the mechanism also has caused the failure of this type of mechanism to latch.

The guide rods of the quick-break mechanism are flat on one side and slide against a key which prevents them from turning. This has been subject to binding with the result that upon opening the switch the latches have disengaged immediately, throwing at least a portion of the arcing duty on the main contacts and causing a slow break in place of a rapid break. If one latch remains engaged and the other releases immediately all of the arcing duty is thrown on one break in place of the two as intended. It also has been found difficult to maintain an adjustment which will cause all latches to disengage simultaneously due to the lack of a positive stop to disengage them. They depend upon friction and spring tension to disengage them and any slight change in adjustment effects materially the time at which the latches are released.

The condition of the latching mechanisms is tested from the outside with some degree of satisfaction by means of lamps but this method does not indicate whether or not the latches are simultaneously released, as the first latch to break contact will open the circuit.

It also is necessary to remove the oil from this type of circuit breaker in order to inspect the contacts. However, a periscope is in the process of development and this, due to the fact that the contacts are not enclosed, might make it possible to inspect them without removing the oil.

Circuit Breaker Experiences of the Coast Valleys Gas & Electric Company

By T. W. SNELL

Prior to 1925 there were three 60-kv. feeder oil switches on the system. They were all of the old Pacific Electric Manufacturing Company type, 2-break, rated 60 kv., 200-amp., with current transformers mounted in the switch on one of the supporting insulators.

The switches controlled 60-kv. feeders from a bus which was supplied over two 2/0 75-mile copper lines at 60 kv. The 60-kv. supply lines were fed by a 15,000-kva. bank of 204/60-kv. transformers from a twin 104-kv. circuit.

As the 60-kv. feeders several years ago were poorly insulated the switches were subjected to frequent duty, but the reactance of supply lines and transformers was sufficient to pull the voltage down before the switches opened.

They were not equipped with bypass switches and were so mounted that a thorough inspection was impossible without raising the entire switch and causing a long interruption to service. The switches operated for five years with only such inspection as could be made through a hand hole on top of cases. During that time all of the switches operated at least 100 times under relay action and one of them operated approximately 250 times. During that period the oil was filtered once or twice and samples of oil taken showed a good dielectric test. After the switches were removed from service they were dismantled and found to be in very good condition. The contacts were burned somewhat but not sufficiently to cause poor contact; the deposit of carbon in the bottom of the tanks was slight.

Three Pacific Electric 70-kv., 250-amp., 2-break switches of late type now are in service on 60-kv., 2/0 copper lines located about 25 miles from a 10,000-kva. condenser. These have operated a few times under short-circuit conditions and have shown no evidence of distress. Three Pacific Electric 70-kv., 6-break switches recently were installed in the station where the above mentioned condenser is located, but have not opened under relay action so that there has been no indication of how they will act. All of the switches now in service are equipped with bypasses and are subjected to routine inspection.

The 60-kv. neutral is grounded at the 104/60-kv. station and also at the main switching station where the condenser and the three 6-break switches are installed.

The three original switches were removed at the time the condenser was installed so they did not operate under that additional burden.

The operating experience of this company demonstrates that very small switching capacity can be used when there is sufficient line reactance to reduce the interrupting duty.

Oil Circuit Breaker Report of the San Joaquin Light & Power Corporation

By R. C. DENNY

The subject of oil circuit breakers as presented by this company last year dealt largely with methods of increasing the rupturing capacity of existing breakers that otherwise would have become obsolete owing to the increased capacity of the system. It may be noticed from the tabulation of circuit breakers that the old 70-kv., 2-break, 200-amp. Kelman breaker is greatly in the majority on the San Joaquin system. Most of these old breakers are getting by in service because of their particular locations on the system; usually remote enough, by reason of the high reactance of the connecting transmission lines, to limit the short-circuit currents to within safe rupturing values. At several points, however, rather than discard these 2-break switches where stations were being remodeled they were connected up two in series to operate simultaneously thus being in effect one 4-break switch.

In the past three years the new transmission breakers that are being installed in largest numbers are the Keyman type CB72, 4-break as shown in Fig. 1. Practically all of the 110-kv. Kelman breakers in use are of this same type except for larger tanks and bushings. A few of the Kelman type D4 breakers are in service. These are the same as the type D-6 except for the number of breaks. These breakers may be increased to 10 breaks by adding pantograph units. There have been no special tests made on the transmission system to determine the ultimate rupturing capacity of any type of breaker nor does there seem to be much opportunity to conduct such tests in an experimental way. However, the breakers are undergoing tests in actual service that give some valuable data even though not approaching the accuracy of experimental set-ups.

Pursuant to the action of the apparatus committee of 1924-5 in adopting a definite plan of recording

breaker operations this company has, during the past 11 months endeavored to analyze each transmission-breaker operation with the view of ascertaining at least the approximate current ruptured in each case and to note the resulting condition of the breakers. The calculating board built by the company and described in 1925 committee papers was of considerable assistance in this study. However, the fact is fully realized that it is most impossible to simulate the trouble conditions exactly even though their nature

TABLE I.—Transmission oil circuit breakers of the San Joaquin Light & Power Corporation

Voltage	In Power Houses		In Substations		Total
	Trans-former Breakers	Line Breakers	Trans-former Breakers	Line Breakers	
33-kv.....	2	2	7	5	16
69-kv.....	17	14	53	72	156
110-kv.....	5	4	8	11	28
Totals.....	24	20	68	88	200
Manufacturer					
Kelman Elec. & Mfg.	16	140	24	180	180
Pac. Elec. Mfg. Co. ....	..	7	..	7	7
Gen'l Elec. Co. ....	..	9	..	9	9
Westinghouse Elec. ....	..	..	4	4	4
Totals.....	16	156	28	200	200
Further Classification of Above Breakers					
Make	Style	Voltage (kv.)	Breaks	Amps.	Type
Old Kelman.....	Indoor	70	2	200	C-1
Old Kelman.....	Outdoor	70	2	200	CB-7
New Kelman.....	Outdoor	70	4	400	CB-72
Old P. E. M.....	Outdoor	70	2	300	866
G. E. Co.....	Indoor	70	2	150	F Form K-10
G. E. Co.....	Outdoor	70	2	150	F Form KO-26
New Kelman.....	Outdoor	110	4	400	CB-72
New Kelman.....	Outdoor	110	4	400	D-4
Westinghouse.....	Outdoor	110	2	400	G-11

might be known. Due to the unusual amount of lightning and severity of the storms during the past season there has been an unusual number of trip-outs of the transmission breakers. In fact during the past 10½ months' operation there have been 394 trip-outs, the great majority being on the 69-kv. system. In spite of this seemingly great number of trip-outs the power service has not suffered particularly owing to the layout of the transmission system which provides two or more feeders for each substation.

Ordinarily, on loop systems, two trip-outs per case of line trouble would be expected. Some troubles may cause more than two trip-outs and some less, therefore, upon analyzing the 394 trip-outs it is rather surprising to find that the ratio of trip-outs to troubles is only 1.23/1. Of course some troubles occur on stub lines where it is necessary for only one breaker to trip. In other cases the tripping of one breaker so reduces the voltage that the arc clears before another breaker can trip. This of course shows on the face of the thing that there cannot be many trip-outs when there should not be. Another interesting finding is that out of the 230 disturbances causing trip-outs there were only 90 cases or 39 per cent where the line actually was disabled so that it could not be closed right back into service. It might very well be said then, that the difference or 61 per cent of potential line failures were prevented by the automatic operation of breakers.

Getting back to the actual operations with respect to rupturing duty it might be well to review the short-circuit characteristics of the transmission system on which these switches operate. Based on full load operation of 203,300 kva., all plants on the line and including interconnections, the normal full-load current would be 1,690 amp. on a 69-kv. basis, or 1,070 amp. on a 110-kv. basis. Tests on the calculating board seem to indicate the average system reactance to be in the neighborhood of 63 per cent. The total instantaneous 3-phase short-circuit current on the 69-kv. system thus is limited to approximately 2,700 amp. and on the 110-kv. system to 1,700 amp. Instantaneous values for phase-to-phase shorts may be 1½ times these values and for grounds 2½ times. However, owing to the time delay imposed by the protective relays and the mechanical action of the breakers themselves which total is on the order of ¼ sec. at the very minimum, it is found that the

current falls to considerably lower values. Thus in the great majority of cases the breakers successfully rupture the currents.

Over the period covered by this report there have been six occurrences which, although classed as circuit-breaker failures, were not all failures to rupture but rather tank or bushing failures due to secondary or gas explosions. However, if these had been failures to rupture, the percentage of failures out of 394 trip-outs would have been just about 1.5 per cent or 3 per cent of the number of breakers in service. The total short-circuit current is not often broken by any one breaker in a loop system, but rather by breakers on stub lines. When such lines are out of substations

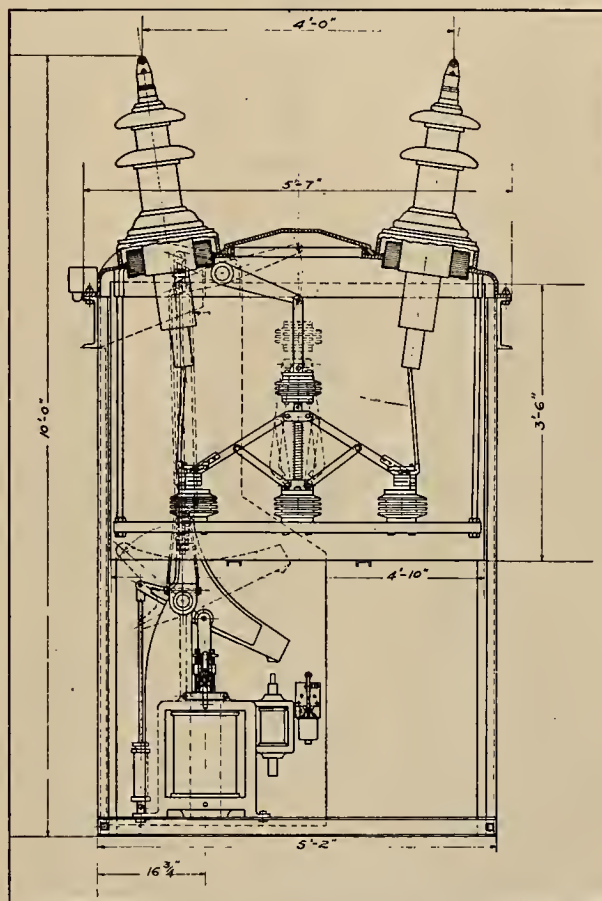


Fig. 1. Kelman 70-kv., 4-break oil circuit breaker; sectional view, typical construction.

which are in a loop or have several sources of power the rupturing duty may be extremely severe. This is true of the high-voltage breaker on a substation transformer bank although admittedly there is not nearly as great a chance for trouble there as on a line of appreciable length. The breaker failures mentioned were far from being wrecks as usually only one tank was affected and soon was repaired and put back into service. Surprising to say the contacts have been found in fairly good condition after apparently serious failures. This probably is a good indication that the failure was due to a secondary explosion. Some failures have been due to flashovers inside the tanks due to birds' nests. Hence it has been found necessary to plug up all holes or cracks about the breaker covers.

This company has no definite program of internal breaker inspection based on number of operations. It has been the practice of going into breakers only after they exhibit signs of stress after troubles, or in case any appreciable quantity of oil is thrown out. The fact that breakers emit smoke during operations does not necessarily justify opening up a breaker for inspection. The analysis and record of breaker operations now being kept is expected to bring out a somewhat definite relation between the number and severity of operations and the necessity for inspection. At any rate at the present when a breaker is opened

for inspection and maintenance its record of operations is studied to establish, if possible, any significant facts as related to the findings. Practically all the transmission breakers that operate automatically are equipped with bypass switches so that it is possible to take the breaker out of service without interruption to service.

TABLE II.—Summary of oil circuit breaker tripoints on San Joaquin Lt. & Pr. Corp. System over 10½-month period—April 15 to March 1, 1926

Make	Breaks	Amps.	No. Tripouts	Av. Cur. Ruptured (amps.)	Max. Cur. Ruptured (amps.)
33-kv. System					
Old Kelmans.....	2	200	22	510	890
69-kv. System					
Old Kelmans.....	2	200	192	776	2700
Rebuilt Kelmans.....	4	200	29	1335	3050
New Kelmans.....	4	400	75	1019	2400
Old P. E. M.....	2	300	36	470	1575
Old G. E.....	2	400	7	993	2590
110-kv. System					
New Kelmans.....	4	400	31	898	1780
New W. E. & M.....	2	400	2	1045	1505
Total.....			394		

The breaker operations over a 10½-month period have been summarized for this report in Table II. No distinction has been made between 3-phase, 2-phase or star-phase shorts. The highest currents ruptured of course are the ones due to star-phase shorts or grounds. These inflict the greatest strains on a breaker but more on account of the high voltages accompanying such disturbances. It is likely that many breaker failures are due to internal break-down due to these high voltages secondary to the real trouble, it is true, but nevertheless wrongfully attributed to failure to rupture. Therefore the insulation of high-voltage breakers bears an important relation to successful operation of the breakers.

Remarking further on the tabulation it is interesting to note that the average current as ruptured by the rebuilt Kelman 69-kv. breakers (the two in series as mentioned before) is somewhat greater than that broken by the old 2-break Kelmans. This shows that the step was in the right direction. It may be noticed also that one of the highest currents ruptured on the 69-kv. system was by one of the old indoor G.E. 2-break, 150-amp. breakers when the line was struck by lightning a few hundred feet from the breaker, yet no damage resulted; not even any oil was thrown out. The Westinghouse breakers, while considerably in the minority, got in two operations as may be noticed and ruptured slightly more current on the average than their 4-break competitors, yet fully as successfully. The conclusions are that circuit breakers fail for reasons other than purely the inability to rupture current and that tank strength and insulation are quite as important as the number of breaks, speed of operation, or other features of design.

Circuit Breaker Experiences of the Los Angeles Bureau of Power and Light

By H. H. COX

Circuit breakers in service at distribution stations of the Los Angeles Bureau of Power & Light

33-kv. Breakers					
No.	Make	Type	Amps.	Breaks	Style
7	Kelman.....	CB2	250	2	Indoor
50	Kelman.....	CB3	250	2	Indoor
1	Kelman.....	CB4	250	2	Outdoor
5	Kelman.....	CB7	250	2	Outdoor
7	Kelman.....	CB24	300	4	Indoor
62	Kelman.....	CB36	300	6	Indoor
2	Kelman.....	CB76	300	6	Outdoor
33	Kelman.....	2D6	300	6	Indoor
			600		
			1,200		
2	Kelman.....	2D10	600	10	Indoor
36	Kelman.....	DA6	300	6	Outdoor
110-kv. Breakers					
24	Westinghouse.....	GA	600		Reactance type
2	Westinghouse.....	G11	800		
10	G. E.....	FK36	600		

110-kv. Switches

During the year there have been several relay operations on these breakers and although they throw a little oil and smoke they have in all cases satisfactorily opened the shorts. It is believed that they are approaching the limit of their interrupting capacity. The duty on these switches at the Los Angeles end of the system is about 800,000 kva. There is some evidence of vertical movement of these switches when interrupting short circuits, due to oil throw.

The reactance-type breakers have given much mechanical trouble due to the complexity of the mechanism. All rigid oil-pipe connections have been removed from these switches on account of the motion due to oil throw and as an earthquake protection.

33-kv. Switches

The principal feature of the year has been the installation of 36 of a new type of switch which was designed to stand up under heavy internal pressure. This is the Kelman DA-6. It is a 6-break switch with all parts designed to stand up to about 900 lb. per sq.in. It is provided with a blowout plate which is intended to go considerably under the 900-lb. limit.

The design of this switch was brought about by a study of what happened to breakers when they really failed. In almost every case under this study there was a tank failure due to weakness of tank design. Following out this same line of thought a complete survey of all breakers in use was made and a program now is under way to bring all switches up to certain standards of tank strength. Through the co-operation of the local manufacturer this has been made possible. Cast-steel heads have been replaced by cast iron. Thicker boiler-plate tanks with oval ends and reinforced sides and bottoms have replaced sheet-metal tanks; 4-break switches have been changed to 6; and all this at moderate cost with no unnecessary delay. In most cases it is possible to make a breaker that will stand 150-lb. internal pressure while a smaller number will be brought up to 50 or 60 lb.

Several short circuits of from 500,000 to 750,000 kva. have been opened successfully during the year.

Maintenance Methods

Considerable study has been done on switch maintenance during the year. The principal feature noted on the heavier short circuits is the increased amount of carbon formed and the very evident magnetic blowout action on currents of 8,000 amp. and above. Our study and observations have caused us to increase our vigilance in switch maintenance, with more frequent overhauls. The number of short circuits allowed before inspection has been cut down from about six to only two or three.

Oil Circuit Breakers in Use by the Southern California Edison Company

The following table will furnish a list of the high-tension oil circuit breakers in use on the system of the Southern California Edison Company, classified according to voltage and manufacture:

Manufacture	60 kv.	
	Automatic	Non-Automatic
General Electric Co.....	63	12
Westhouse Elec. & Mfg. Co.	36	0
Kelman Elec. Co.....	385	26
150 kv.		
General Electric Co.....	19	14
Westinghouse Co.....	7	6
220 kv.		
General Electric Co.....	14	0
Westinghouse Co.....	16	4

Kelman Switches

From a study of the above table it may be seen that the majority of the switches in use on the system of the Southern California Edison Company are of Kelman Electric Company manufacture. These switches have been in service on the system for a number of years and when proper consideration has been given to the application, they have given good service. In common with other types of switches, it has been necessary to see that the growth of the system does not impose greater short-circuit stresses upon the switch than originally was intended.

OIL SWITCH OPERATING RECORD
PROTECTION ENGINEERING DEPARTMENT
SOUTHERN CALIFORNIA EDISON COMPANY.

Date _____
Time A.M. _____
Time P.M. _____

Switch Location _____ Name or Number of Switch _____

(Automatic _____)

Manufacturer's Name _____ Type of Switch (Non-Automatic _____)

Number _____ Type of Oil Used _____ (No. of Breaks _____)

Voltage _____ Rated Current Capacity _____ (Carrying _____)

(Returning _____)

Number of Automatic Openings since last overhaul _____

Nature of Overload _____ Ground _____ Approx. Current Interrupted _____

Single Phase _____

Three Phase _____

Findings:

General

External

Conditions

Internal

Conditions

Was Opening Satisfactory?

(Pushings broken or cracked) _____

(Switch top broken or cracked) _____

(Tanks bulged or split) _____

(Oil spillage or leakage) _____

(Bushings) _____

(Blades) _____

(Contacts) _____

(Oil (dirty, wet or carbonized)) _____

Phase A

Phase B

Phase C

By _____

Protection Engineer,

Fig. 1. Oil circuit breaker operation record used by the protection engineering department of the Southern California Edison Company.

The greater portion of these switches are solenoid operated although a number are operated by compressed air with electric trip. It has been found that close attention must be given to the operating mechanism so that any defects which might develop in operation and which would interfere with the satisfactory functioning of the switch, are located before the switch is called upon to clear a severe short circuit. The present tendency of the manufacturer of this switch is to go to heavier tanks than heretofore used and to decrease the size of tanks insofar as proper clearance to ground will permit. There have been a number of installations in southern California using the extreme heavy duty Kelman switch, but to date there has not been sufficient experience to see what improvement the heavier tank with a smaller amount of oil provides as against the larger tank with the larger amount of oil. Improvements recently have been made in the design of the arcing tips so that there will be less tendency for the switch contacts to weld when the switch is closing in on a short circuit.

General Electric Switches

There have been a few installations of extreme heavy-duty switches manufactured by the General Electric Company for use on 70-kv. or, as it is commonly known, 60-kv. operating systems. At the Long Beach steam plant of the Southern California Edison Company 60-kv. breakers have been installed having an interrupting capacity of 1,250,000 kva. At the Eagle Rock substation 60-kv. breakers have been installed of a similar design having an interrupting capacity of one million kva. There is no doubt but that the growth of the system soon will result in a test of those switches, at the time of a short circuit, up to the limit of their interrupting-capacity rating.

The 150-kv. and the 220-kv. oil circuit breakers of modern design have been called upon a number of times to operate and have given satisfactory performance. There is a case of one of the older designs of 150-kv. oil circuit breakers in use on the Big Creek system causing some trouble, apparently due to loosening of contacts or to a flashover of the bushing inside of the breaker. These extra-high-

voltage breakers have not been called upon to interrupt short-circuit current up to their full rated kva. However, within the next few years these breakers will be subjected to short-circuit duties between a million and 1½ million kva., which will be near the limit of their capacity.

Westinghouse Switches

The 60-kv. and the 220-kv. switches of this manufacture which are in use on the system are mostly of modern design and very little trouble has been experienced in their normal operation and in their per-

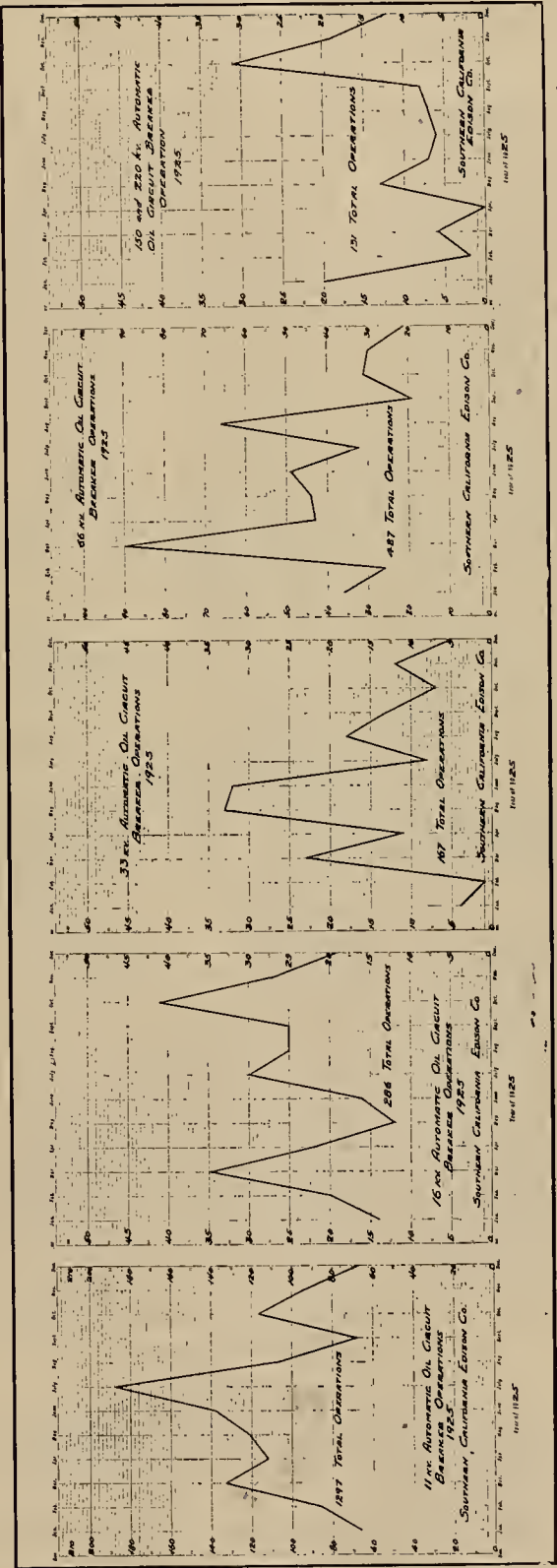


Fig. 2. Series of record sheets showing graphically the number of operations of each class of oil circuit breakers on the system of the Southern California Edison Company for 1925.

formance at the time of clearing short circuits. There has been some trouble on the higher voltage breakers due to loosening of some of the internal mechanism of the switch as a result either of sustained vibration or severe normal operating service. The 150-kv. breakers, while of an older design, have given good service and no outstanding trouble has developed with them.

All of the higher voltage switches on the system are manually controlled and no reclosing mechanism to be adapted to these switches is contemplated in the near future. The reclosing mechanism is being used and is being considered more and more on switches of lower voltage, but that feature of oil circuit breakers does not apply in this report.

Operating Records

A careful record of the automatic operation of oil circuit breakers has been kept during 1925 and is shown on the accompanying charts, each chart being plotted in a certain class as regards voltage. It may be noted that charts are presented showing the automatic operation of 11-kv., 16-kv., 33-kv., 66-kv., and 150 and 220-kv. automatic switches. These charts are submitted in lieu of a tabulated summary.

A system has been inaugurated of making a careful check of the oil circuit breakers where it has been called upon to clear a heavy short circuit. The data which are being collected are based on the recommendations of the oil circuit breaker subcommittee of the P.C.E.A. and a sample of the record form used is shown in Fig. 1. It is believed that it is unnecessary to consider every automatic operation and calculate the current interrupted at this time, as we are interested primarily in observing and setting the performance of the oil circuit breaker at the time of heavy duty or duty somewhat near its rated capacity. A table showing the results of an analysis of some of the outstanding clearances of trouble is shown in Table I.

TABLE I.—Some examples of automatic oil circuit breaker operation on the system of the Southern California Edison Company during 1925.

Station	Voltage of Circ. (kv.)	Make of Breaker	Normal Current carrying capacity (amps.)	Rated Cap. (amps.)	Current Interrupted (amps.)	Result of Auto. Oper.
Belmont.....	11	Mfg. B	300	1735	2630	Blew up
Katella.....	11	Mfg. A	1200	11550	8800	Spilled oil
San Bernardino	11	Mfg. B	300	1735	925	Smoked
Venice Hill....	11	Mfg. B	300	1735	1095	Smoked badly
Vernon.....	15	Mfg. A	600	12320	13400	Threw oil
Carson.....	15	Mfg. C	800	..	7050	Smoked
Chino.....	60	Mfg. C	400	..	1980	Threw oil
Laguna Bell...	60	Mfg. C	400	..	6800	Threw oil
San Fernando...	60	Mfg. C	300	..	4630	Smoked
Eagle Rock...	150	Mfg. B	300	3610	860	Blew up
B. C. No. 3...	220	Mfg. A	600	2620	486	O. K.
Laguna Bell...	220	Mfg. B	600	3940	660	O. K.

More careful records of the performance of oil circuit breakers are being kept each day, both from the standpoint of automatic operation and from the standpoint of routine operation. The experience during the past year certainly justifies this practice and shows that care taken in operation and frequent overhauling of oil circuit breakers goes a long ways toward keeping down troubles on this very important piece of electrical apparatus.

System Oil Circuit Breakers of the California Oregon Power Company

By R. S. DANIELS

This company has in service on its transmission system 19 Kelman 70-kv. breakers, 7 Pacific Electric Manufacturing Company 66-kv., 5 Westinghouse 73-kv. and one same of 132-kv. rating; a total of 32 high-voltage breakers.

Enough breakers have not been in service a sufficient time to give much information from experience. It is believed that the principal inadequacy shown has been lack of mechanical strength and lack of size. It is believed that nearly all troubles, which on the whole

have been comparatively few, have been due to the breaker being too small for its job. It can be said therefore that the greater part of our maintenance has been due to lack of mechanical strength.

A very complete record of the performance of breakers has not been kept and no regular periods of inspections have been made. Maintenance and overhauling has been done only after signs of trouble, or when breakers were moved to new locations. It has not yet been our practice to make inspections after any certain number of operations, although it is believed that this should be done.

Circuit Breaker Experiences of Los Angeles Gas & Electric Corporation

By F. R. KNIGHT

This company's experience with oil circuit breakers has been very satisfactory. This has made it hard to furnish a report worth while. Our experience may be due partly to selecting breakers of a capacity ample to rupture maximum shorts at the point of installation. We use oil only as specified by manufacturer. A shipment of oil is checked for fire, flash, viscosity, acidity and dielectric strength, to see that it meets their specifications.

Large breakers are inspected once in six months of normal operation. After clearing a short they are opened at once, cleaned, the oil is filtered and inspected, and adjusted if necessary. The only breakers at and between power houses are General Electric and Westinghouse.

We have had a little trouble with some breakers hanging up on the quick-break mechanism of the arcing contacts. This was caused by the use of a too-heavy spring in this mechanism. However, this caused no serious difficulty as the switches were not clearing a short at the time.

A list of the more important breakers at our two power plants is given in Table I.

TABLE I.—Circuit breakers in service on the system of the Los Angeles Gas & Electric Corporation

No. in use	Mfr.	Type	Capacity	Possible Short
At Seal Beach Station				
4	West.	G-22	110-kv., 400-amp.	3,950 amp.
2	West.	G-22	110-kv., 600-amp.	3,950 amp.
At Alameda Street Station				
4	G. E.	FH-206	15-kv., 1,200-amp.	11,800 amp.
16	G. E.	FH-203	15-kv., 500-amp.	15,000 amp.
4	G. E.	FH-206	35-kv., 500-amp.	11,800 amp. at 15 kv.
8	G. E.	FH-203	35-kv., 500-amp.	15,000 amp. at 15 kv.
1	G. E.	FH-209	15-kv., 5,000-amp.	38,600 amp. at 2.4 kv.

NOTE. The 35-kv. switches are operating on 15-kv. lines. The FH-209 is operating on 2.4 kv.

Oil Circuit Breakers on System of The Southern Sierras Power Company

The Southern Sierras Power Company, oil circuit breakers in service

No.	Mfr.	Type	KV	Amps.	Breaks	Remarks
3	W. E. M. Co.....	G-2	115	400	2	
2	Kelman.....	..	110	200	2	
4	W. E. M. Co.....	G-2	95	400	2	
3	Kelman.....	..	88	200	2	
1	Kelman.....	..	70	200	4	
2	Kelman.....	..	60	200	4	
6	Kelman.....	..	60	200	2	
12	Kelman.....	..	60	200	2	Non-automatic
1	Kelman.....	..	55	200	2	
2	Kelman.....	..	35	200	4	
34	Kelman.....	..	35	200	2	
4	Kelman.....	..	15	200	2	
3	W. E. M. Co.....	..	15	200	2	

Electrical Grounds*

By F. H. MAYER

The subject of grounds is attracting more attention today than ever before in the history of the electrical industry. This may be accounted for in numerous ways.

At the beginning of the electrical industry generating units were small and, as a result of the fact that insulation was poor, it was considered more important to insulate the frame of the generators and motors than to make a special effort to ground them.

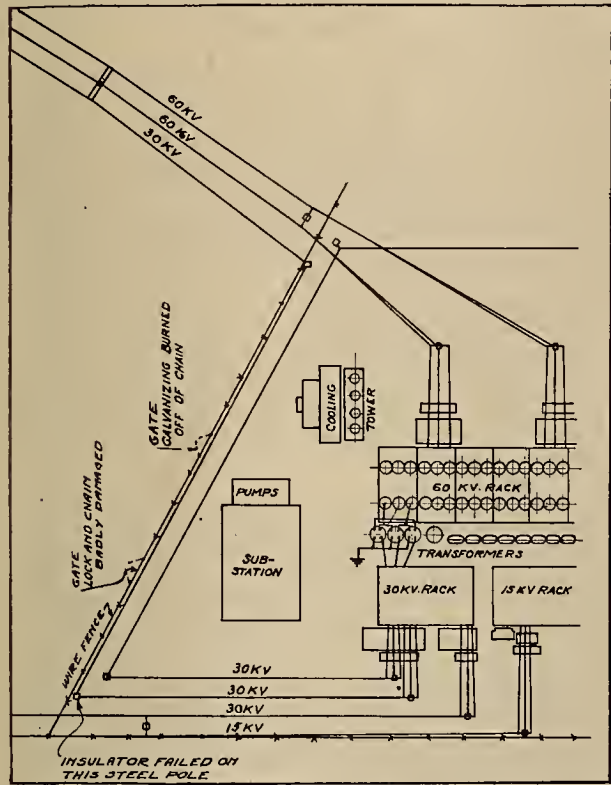


Fig. 1. Plot plan of L. A. No. 3 substation of Southern California Edison Company showing relation of pole where insulator failed to rest of equipment.

Later, as the manufacture of insulating material was better understood, the practice of insulating the frame of the equipment became less common. The fact that lighting constituted the major portion of the load and that distribution lines extended over quite an area, no branch of which carried very much current, the voltage was low. Thus when a ground occurred the reactance of the line, considering the low voltage used for distribution, limited the current to such an extent that the matter of potential gradient and ground current control was of no concern.

When generating capacities became larger and higher voltages were used it became more and more recognized that the grounding of all equipment was important. However, due to the evolution of the practice of insulating the frames of the generators and motors, contrary to that of grounding of the same, there seems to have been considerable lag in the methods over the demand of the real requirements.

With the present policy of most public utilities of massing large blocks of power by means of inter-connection this apparent lag is being appreciated more than ever before. There has been sufficient interest stimulated to cause a national study to be made of the subject by the a.c. substation subcommittee of the

*Report of Joint Subcommittee of Electrical Apparatus Committee, Overhead Systems Committee, and Safety Rules Committee. F. H. Mayer, Southern California Edison Company, chairman. F. E. Dellinger, Los Angeles Gas & Electric Corporation. E. R. Stauffacher, Southern California Edison Company. W. H. Talbott, San Diego Consolidated Gas & Electric Company. G. E. Nott, Southern California Telephone Company. H. N. Kalb, San Joaquin Light & Power Corporation. G. E. Young, Pacific Gas and Electric Company. R. H. Cates, Southern California Edison Company.

electrical apparatus committee of the N.E.L.A., the report of which is dated April, 1925.

In general the industry is pretty well agreed upon the chief functions of an a.c. grounding system, namely, protection to life and continuity of service. However, there seems to be some question as to the exact method of accomplishing these ends.

The fundamental points in any grounding system are as given below. While the discussion applies more directly to the grounding of substations and power-houses, the principle in other types of grounding is involved.

1. That current on the occurrence of an accidental ground always passes or tends to pass from the point of failure to the generator neutral or transformer neutral, or in case of an isolated system to some point of defective insulation on other phases.
2. That when current passes over a conductor there is a potential drop due to the loss in the conductor, ordinarily referred to as the potential gradient. Due to the heavy capacities back of most systems this is a factor that enters in on nearly all station grounding.
3. That current will follow the path of least resistance.

For failure that is foreign to the station, the first consideration can be cared for by the use of ground electrodes. For the best protection these ground electrodes should be tied to every medium of return. For example, if a pipe line or a wire fence parallels

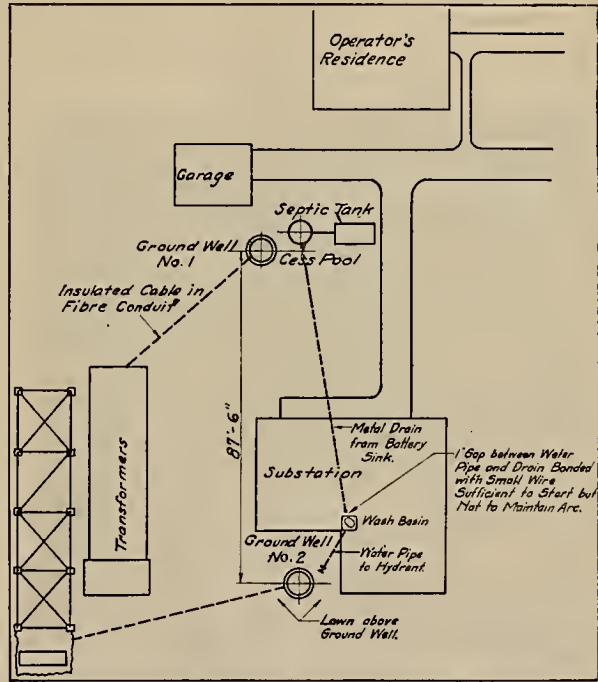


Fig. 2. Plot plan of substation grounds where stray ground current damaged water pipe and other equipment in seeking return path to ground well.

or crosses somewhere near a line failure to ground the pipe or fence in many cases will serve as a better conductor to the transformer neutral than will the earth. Unless there is at the station a low-resistance path from this medium of return to the transformer neutral there may be a sufficient difference of potential developed to force the current through some of the vital parts of the station. It even may prove hazardous to the operators.

Operating Experiences

The experience of the Southern California Edison Company at its Los Angeles No. 3 substation stressed the importance of the above points. Near this station there occurred on one of the steel poles a failure of one of the 30-kv. insulators which caused the pole to be energized, Fig. 1. The pole was set in concrete and not grounded. Evidences showed of the current's passage over the surface of the ground a distance of approximately 2 ft. to the property fence, following the fence and passing through a chain and lock on two gates and thence over to the substation structure.

The first lock and chain were damaged beyond use and the second had the galvanizing completely burned off. All along the fence there was evidence of the passage of current from the fence to the posts; the metal on the fence posts was blistered. This, however, was less noticeable nearer the substation.

This incident stresses the importance of tying all steel poles on the property, and each section of fence immediately around the property, to the station grounding system. It happened that this pole had no grounds of any kind, but it is believed by the engineers that, even though the pole were grounded to a driven pipe, due to the limited amount of moisture in the soil the current would have taken the same course as it did without the ground.

For failures at the station it is necessary to have all steel, transformer cases and oil circuit breaker tanks grounded to the transformer neutral. Should this not be done and the neutral ground isolated from the steel ground at the time of trouble, due to the reactance between the two grounds there is danger of high-potential stresses developing between the

ited network which ties to the structural part of the rack and also to the transformer cases. This network is tied to ground well No. 2.

A flashover occurred on the 60-kv. rack, a discharge from one leg of the 60-kv. line to the steel at the point of support. The lowest-resistance path for the current thus discharged was to the neutral of the transformer. Analyzing it from this point of view it would seem most probable that the current which went astray was conducted to ground well No. 2 and from No. 2 to the water pipe which terminated near ground well No. 2. The current then jumped a small gap between the water pipe and drain, through the drain to cesspool, through the earth from the cesspool to ground well No. 1, from ground well No. 1 to the transformer neutral.

While it is true that the damage was small, should the path have been of considerably higher resistance the current might easily have gone through the control board and proved much more serious. If the steel and the transformer cases were grounded to the neutral at the rack the circuit would have been satisfied without the necessity of taking the course it did.

The majority of the committee feels that this experience shows that it is more important to control the stray current by the use of metallic conductors than to secure mere contact with the earth. These ground wells gave a test of very low resistance at the time of installation, but notwithstanding this fact it is proved by the path which evidence shows the current took that there was less resistance from the water pipe to the drain and from the drain to the cesspool, and to ground well No. 2 than the alternate path from ground well No. 2 to earth and then to ground well No. 1.

By taking care of the first consideration the matter of the second consideration, which has to do with potential gradient, is practically cared for. When all steel is grounded, at all piers and foundations there usually is a sufficient network formed to serve as what is known as a large plate; as a result of the low conductivity of this plate the potential gradient is held within limits safe to human life. See Fig. 3.

The third consideration, that current seeks the path of least resistance, is a point particularly interesting when the safety of equipment is considered. This applies more particularly to remote-controlled stations where the control board has conduit radiating to various equipment. Should a failure occur on any part of the station equipment the stray current thus formed would pass to the neutral of the transformer.

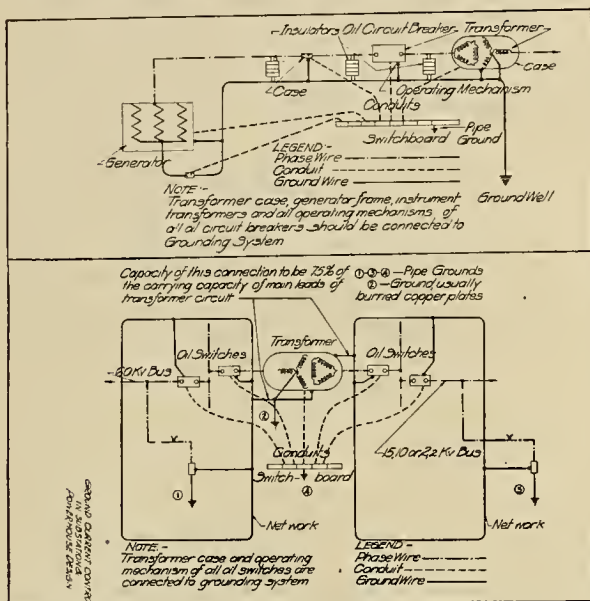


Fig. 3. Plans of ground-wire systems that provide adequately for return of ground current.

neutral end of the winding and the transformer cases. This is true particularly should the lightning arrester ground be of considerably less resistance to the steel ground than to the transformer-neutral ground.

One of the members of this subcommittee took exception to the grounding of all non-current-carrying structures to the neutral of the transformers; therefore the following:

It has been the practice for the past three years for the Southern California Edison Company to tie all non-current-carrying structures to the neutral of the transformers together and there has been no difficulty experienced in so doing. However, prior to that time transformer neutrals and equipment were isolated and grounded to separate ground wells. The difficulties experienced at one of these substations as a result of this practice are given in the following paragraphs.

The trouble showed up, following a flashover on the 60-kv. rack, in the water piping in the wash room of the substation where a metal sewer pipe crossed near the water pipe.

Figure 2 shows in a general way the two ground wells of the substation, also the location of these wells. Ground well No. 1 is for the neutral of the transformer. Ground well No. 2 is for the so-called station ground. The neutral conductor of the 60-kv. side of the power transformers is carried on insulators and run into the ground well through fiber conduit. In other words it is isolated from all equipment including the earth along the path to this particular ground well. The station ground consists of a lim-

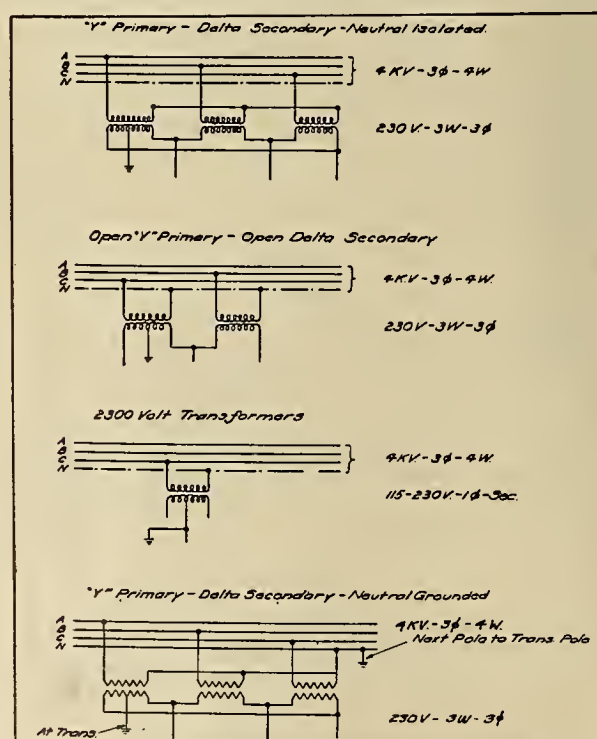


Fig. 4. Different ground connections used by various companies.

The conduit which radiates from one part of the equipment to the other may be in direct line or of lower resistance than the path through the earth's surface. Thus it is important to by-pass the control board with a conductor of impedance low enough to prevent any stray ground current from passing through the control board.

Building structures, immediately along the area where conductors of heavy carrying capacity are run, likewise should be supplemented by heavy ground cable. Thus at the time of a failure of any insulating support the cable will serve to keep the current out of the reinforcing of the building and also relieve the danger of current destroying the plumbing and other

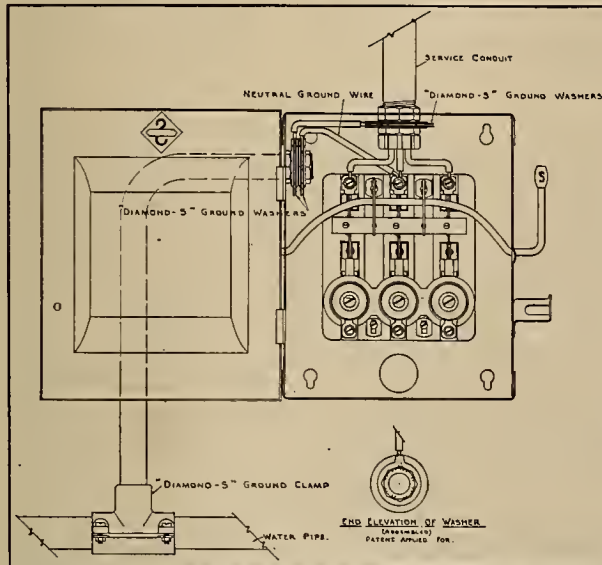


Fig. 5. Approved method of grounding at service switch.

fixtures; see Fig. 3 (upper).

At the beginning of the year the committee decided to study the following subjects:

1. Grounding of distribution lines, more particularly as applied to 4-kv., 3-phase, 4-wire systems, with the object of safety, continuity of service, and a minimum amount of communication disturbances.
2. Grounding on consumer's premises.
3. Grounding of substations and powerhouses.

Grounding of Distribution Lines as Affecting the Power Company

As mentioned above, the committee undertook a study of the grounding of distribution lines, more particularly as applied to 4-kv., 3-phase, 4-wire systems from the standpoint of safety, continuity of service, and a minimum amount of communication disturbance. Time did not permit an extensive study, but certain fundamentals in connection with the problem were discussed in considerable detail. Specific methods for obtaining grounds were not discussed.

The study resolved into a comparison of certain fundamental features of the 3-phase, 4-wire systems that operate with only one ground on the neutral, this ground being located at the substation; and those systems in which the neutral wire is grounded at several points. Examples of both of these systems are in successful operation on the Pacific Coast.

Fig. 4 shows a series of different connections used by various companies. Most companies feel that the distributed ground on the neutral wire has advantages over that of grounding the neutral at the station only. However both systems are used. It may be noted in the diagrams that some companies ground the neutral of 3-phase transformer banks while others isolate them. The fact that there has been some difficulty in the southern part of the state to get sufficient current to flow at the time of a failure of any one phase of a 4-kv., 3-phase, 4-wire system to trip out the circuit breakers, caused the following tests to be made. The committee is submitting results of the tests because of their interest, the conclusions of which will be left to the individual reader:

Grounding Tests on 4-kv., 3-phase, 4-wire

Date—September 10, 1925.

Circuit—4-kv. distribution with neutral of transformer bank and neutral wire grounded only at the station.

Problem—To determine the amount of current which would flow on a 4-kv. grounded-neutral circuit. A series of tests was made. A point approximately one mile from the station on the edge of a recently irrigated walnut grove was the location selected for these tests.

Results

Time—11:39 a.m. Coil of bare No. 6 B.&S. copper wire dropped on ground after one end of coil had been attached to one of the phase wires. Slight arc resulted, 0.3 to 0.6 amp. measured current.

Time—11:56 a.m. Duplicate of above. Results practically the same. Sizzling arc, 0.3 to 0.5-amp. measured current.

Time—11:58 a.m. Coil of wire moved over to green grass. Slightly greater arc. 1 to 3.0-amp. measured current.

Time—12:00 noon. Coil of wire moved over to edge of a pool of water. Much more pronounced arc, 3 to 6-amp. measured current.

Time—12:02 p.m. Coil of wire pulled into the pool of water. Vicious arc, 25 to 30-amp. measured current.

Then the same tests were made with insulated wire in fairly good condition. Results were practically the same when the bare end of the wire came into contact with the soil, grass or water. Later the insulation broke through, when the wire was lying in water.

The feeder switch was set at a minimum trip of 115 amp. During all the tests the breaker did not trip out until the ground wire was fastened to a pole anchor and to a bare place on the insulated wire brought into contact with the anchor.

Later operating experience has shown that during storm conditions and with a wire down a feeder switch will trip out, but it appears advisable to



Fig. 6. Result of breakdown on consumer's premises, ahead of all fuses. Service not properly grounded outside of building.

ground the neutral at as many places as practicable along the line as well as in the station.

Grounding Distribution as Affecting Communication

In order that a more complete understanding might be obtained regarding the effects upon communication lines of the grounding of distribution lines a representative of the Southern California Telephone Company was requested to present a discussion of the inductive effects of 3-phase, 4-wire distribution systems upon telephone circuits. This request was made since it was understood that various systems differed materially in regard to their inductive influence. It also was believed that, when considered broadly, the study should embrace those feature which

affect consumers who are in general common to both power and telephone companies.

Summarized briefly, the discussion received indicated that the system operating with the single ground was preferable from the standpoint of the communication utilities. It was stated that such a system was, in general, comparable as regards inductive influence to a 3-phase, 3-wire system transmitting equal power, and such systems had been generally operated in close proximity to exchange telephone circuits with satisfaction to all concerned.

In the case of the multiple-grounded neutral system the increased inductive influence results if current flows in the earth. The amount of such current depends of course upon the relative impedance of the neutral-wire path and the earth path, and also upon the amount of current unbalance of the system. The presence of harmonics in the earth-path current is especially objectionable from the communication standpoint.

As compared to the disadvantage outlined above, it was recognized that the multiple-grounded neutral system has an advantage over the single grounded system from the distribution standpoint. Should a break occur in the neutral wire an unbalance of the star voltages is presented if the system is multiple-grounded. Such unbalance under certain conditions may result in serious proportions.

From a consideration of these fundamental features, which have been briefly outlined, it is believed that the best results can be obtained if, in the design and operation of the 4-wire, 3-phase, multiple-grounded neutral system consideration is given to those features which will as far as practicable reduce to a minimum those effects which might otherwise be objectionable. For example, the disadvantages of the system from the inductive-influence standpoint are dependent upon the current in the ground connection rather than upon the ground connection itself. Certain features in the design and operation of a system will tend to minimize the amount of such current and some of these features will react to the benefit of both the supply and the communication utilities. At the same time others which may be of considerable importance from the communication viewpoint may not impose a burden upon the supply service. As an example of such features the following are recommended:

1. Single-phase loads so connected that phase balance will be obtained with relatively short distances.
2. These phase loads supplied by transformers connected Y-delta.
3. The neutral wire carried throughout the system on the same or adjacent crossarm, with the corresponding phase wire.
4. The length and load of single-phase legs not increased beyond a limit which is reasonably practicable in the provision of service.
5. The avoidance as far as practicable of the use on the system of equipment or equipment connections which may give rise to harmonic components of current or voltage, particularly components of the third harmonic and its odd multiples.

For those interested in further details relating to the inductive features of distribution systems they may be found in a paper on Power, Distribution and Telephone Circuits which was presented by Trueblood and Cone at the A.I.E.E. convention in Seattle in 1925.

The committee wishes also to draw attention to the investigation of 4-wire distribution systems and communication lines which now are in progress by the joint general committee of the N.E.L.A. and the American Telephone and Telegraph Company. It is anticipated that reports on the progress of that work will be available in the near future.

Grounding on Consumer's Premises

The grounding of equipment on consumer's premises usually is in a large way governed by the same fundamentals that apply to substation and power-house grounding. For example, there came to the attention of the committee a condition where the transformers were located on a pole structure in an alley and the transformer cases grounded by means of pipe driven approximately 1 ft. distant from the property fence. The transformer failed and the current resulting from the failure passed from the ground pipe over the wire

fence and from the wire fence to the house. The chicken wire which was used on the house to bond the stucco served to conduct the current to the water faucets. There was no damage done to the house other than at the faucets where the current density was in excess of the carrying capacity of the wire strands. At this point the chicken wire fused and exploded the stucco, damaging the stucco a distance of about 6 in. around the faucet. This only goes to show the importance of having a lower resistance path to ground near the distribution transformer than within the building of the consumer.

Comments by R. H. Cates

R. H. Cates of the Southern California Edison Company has had considerable experience in connection with the matter of grounding on consumer's premises and has been kind enough to give us the following report:

The practice of grounding one side of a 2-wire service, or the neutral of a 3-wire, single-phase service on consumer's premises has been practiced for years in many localities. The actual practice is to make this ground connection by attaching a wire to a terminal on the line side of the service switch and extend this wire to a pipe driven in the ground, a plate buried in the ground, or to the water pipes installed in the building.

During the period when open wiring was being practiced and central-station systems of large capacity seldom were encountered this practice, which was intended to limit the potential from lighting wires on consumer's installations to ground for the elimination of hazard to life, was quite satisfactory.

The rapid increase in development of central-station systems, electric railways and other utilities with their attendant network of transmission and distribution lines of greater capacity, and the adoption of an ironclad wiring job, present an entirely different problem. Grounds on service wires now must be maintained not only to protect the consumer from hazard to life, but in many cases from damage to property in case of high-voltage lines of considerable capacity coming in contact with service wires or secondary mains.

Different Methods

There are many ways in which a ground might be made on a consumer's installation, but the almost universal practice in cities along the Pacific Coast is to ground the conduit system and the neutral wire at the service switch. Fig. 5 shows an approved method of grounding at the service switch. In this case a pipe ground is run from the service switch box to a water pipe to which it is securely fastened by means of a clamp around the water pipe, with a threaded receptacle to receive the ground pipe. The service conduit in addition to being locked to the switch box by lock nuts also is connected to the ground pipe by a copper wire held between two spring washers by an additional nut, on both the service conduit and the ground pipe. A copper wire not smaller than No. 8 B.&S. gage, as specified by the National Code, now is run from the service switch terminals of the neutral wire to this same ground pipe. The smallest size ground wire permitted by the National Code is No. 8 B.&S. The neutral wire of a great majority of the small residence buildings seldom exceeds No. 10 B.&S. This necessitates placing two different sizes of wire under the same terminal screw resulting in a contact of very questionable carrying capacity to protect against what often is an excessive amount of current to ground; particularly during periods of failure of overhead lines in close proximity to secondary mains or service lines.

It is recognized by every one in touch with these problems that the above-stated fact is particularly true of the connections to the service wires that may be called upon to carry excessive current during failures on overhead systems and may, therefore, subject the consumer's premises to a considerable hazard if not able to meet that demand. Therefore it is the writer's opinion that insofar as grounds on the consumer's premises are concerned, they should be made both on the service conduit and on the neutral wire at the point of entrance to the building and not at the service switch. This ground should consist of a pipe attached to the water system and brought up to the service entrance at which point the service conduit and the neutral wire should be attached by separate copper conductors.

The writer has seen many cases where the ground wire had been burned off at the point of contact with the neutral wire inside of a building and several feet of service conduit within the walls of a building had been burned away, setting the building on fire. Many think that a conduit job of wiring eliminates fire hazard entirely. While this may be generally true on the load side of circuit fuses it is not true with the service conduit not so protected and especially with a neutral ground at the service switch.

An ironclad job of wiring, if not properly grounded outside of the building, often may constitute a fire hazard in the event of a breakdown in supply transformers of large capacity. Fig. 6 shows such an instance, where breakdown to ground inside of a consumer's installation started an arc across the disconnecting switches ahead of all fuses, burning holes in iron cabinets and service conduits and resulting in heavy damage.

The National Code at this time permits grounds at the service switch. Until such time as it is possible to get a dependable ground at the point of entrance to buildings it is the writer's opinion that secondary mains should have the neutral wires grounded at intervals along the line by running a pipe ground from water service pipes in the parking space to the nearest pole, extending this pipe a few feet up the pole and attaching it to a suitable ground wire, protected by wood covers, up the pole to the secondary mains. Without such permanent grounds on the secondary mains the breaking of a neutral service wire between the pole and a building would leave the premises unprotected except by the ground inside of some other building.

That might be some distance away and of very little carrying capacity by reason of poor contact usually found in such cases.

Discussion Invited

The section of this report covering Grounding on Consumer's Premises contains some rather radical changes from the present actual practices in the field. They are the result of the writer's conviction that better protection of consumer's installation is highly desirable if it can be obtained without too great an expense to the utility serving the consumer.

Conditions are changing rapidly as a result of expansion of distributing systems, and grounding methods that were entirely suitable years ago no longer are suited to Pacific Coast conditions. The suggestions made in this report are the result of actual cases where service conduits have been burned up, causing

damage to consumer's premises, where properly grounded secondary mains or grounds outside of the houses would have eliminated the trouble. These suggestions are not given as necessarily the best methods to adopt, but to bring about discussion along these lines from which may finally come some solution that will furnish adequate protection without unreasonable cost.

Grounding of Substations and Power Houses

As to station grounding, the points governing this class of work are pretty well covered in the fundamentals. The committee purposely avoided giving detail installations so that they might devote a greater amount of space to some of the principal points. It is believed that this procedure is better for the reason that if the requirements really are understood the matter of applying these principles to individual jobs is a mere detail.

Accident Prevention Committee Reports*

Identification of Cables

By P. F. MELNICK

Cable identification is one of the most important factors in underground work. Much of the safety to men and continuity of service depends on the absolute knowledge of the identity of each cable in a man-hole. Unlike overhead conductors, where miles of wire can be traced, the underground cable is concealed and only exposed in manholes, vaults and on customer's premises. Therefore some method of identifying the conductors at the exposed locations must be taken into consideration.

When underground systems were very small a conduit system consisted of only 4 ducts, covering probably at most one sq. mile of territory. One man had full responsibility of it and it was rather easy for that one man to state with a great degree of accuracy what each conductor was. Even this probably was due to the standardization of cables, the number and size of one duct, and also the location in the system in question. Thus there was not the need of elaborate records in the offices nor extensive labelling in man-holes.

However, in the larger cities underground systems are developing rapidly. In a system of this nature it is too great a task for one man to remember all the circuits and therefore all the different cables in the ground. Consequently a simple system of cable identification is necessary and very essential. It is a fact that a record not maintained properly and not kept up to date is worse than no record at all. Therefore it is absolutely essential that, if a record or system is established, it be maintained to the highest degree of efficiency. One mishap due to faulty records or to ignorance of cable identification may cause serious results.

Probably there is room for much improvement and development over the methods now used by the members of the Pacific Coast Electrical Association.

It is not enough just to have cables labeled in the manholes or to have just an office record; these two forms of identification must be worked in conjunction as accuracy can be assured only by a check system.

Questionnaire Reports

The following is a resume of reports received from members of the P.C.E.A. in reply to a questionnaire on cable identification. Nine member companies were questioned, only seven made reply and but five have an underground system. Therefore the following information is the author's interpretation of operating practices of the five companies.

It is general practice to tag some or all of the cables and also to keep some kind of office record. Each company, however, has its characteristic method of tagging and of keeping office records.

One company identifies its cables by means of

either a sheet-lead tag or an embossed machine-made tag wiped onto the cable sheath. The tags give either the circuit number or information about the circuit. A system of circuit numbers is used to identify the kind of current and voltage, i.e., circuit Nos. 1 to 9, inclusive, represents 2.3-kv. lighting circuit fed from a 4-kv. grounded-neutral system; circuit Nos. 20 to 29, inclusive, indicate 3-phase, 2.3-kv. circuits, etc. This company uses the tags for feeders only; primary 11-kv. cables have a fireproof covering which at once identifies them. The office record is a schematic diagram of the manholes showing one-line diagrams for the circuits together with information as to the size, the number of the cable and the circuit number corresponding to the tag number. This record is called the "handbook" and is made up of blue-prints each 3 $\frac{1}{2}$ x6 $\frac{3}{4}$ in. in size and bound in a loose cover.

Another company uses grass tags, tinned to prevent corrosion and securely fastened to the cable with brass wire. Differently shaped tags are used for the various currents and voltages. This is done to command immediate attention of workmen to the identification of the cable. Methods for distinguishing the different cables are as follows: high-tension lines are named according to the source and destination as, Vaca-Dixon-Claremont. 11-kv. tie lines also are designated by the source and destination with the circuit number; for example if a circuit feeds from station A to station B and if it was the first circuit it would be called AB-1, etc. Primary feeder cables are marked according to the source substation and the circuit number as, A-1, A-2, B-2, meaning substation A, circuit 1; substation A, circuit 2; substation B, circuit 2, etc.

Street-lighting circuits have 2-digit numbers. The first digit indicates the source and the second digit the circuit. For example, 22 means the circuit is fed from substation B and that it is the second circuit. D.c. feeders have 3 digits, indicating the same as above except that the middle digit indicates the voltage.

After a man learns the system he knows accurately what each cable carries, where it feeds from and what it feeds. An office record also is maintained in the form of maps showing every cable in the ground.

A third company uses lead tags fastened with copper wire and with the cable information punched into the tags. The practice of that company is to tag only primary, high-tension and d.c. feeders. Secondaries and other lines are traced from some known point before working on them. In cases where identifying the cable is more difficult a fault finder is used to trace it from the substation.

A cable book is maintained for office record. All cables are recorded in this book giving the number and size of cable, the voltage, use and duct location. A record of this kind if accurate will give all the information necessary to identify any given cable to one who is able to interpret the duct location.

The fourth company tags all cables with lead tags made of scrap sheath with cable information stamped thereon. These are fastened to the cables with copper wire. The information on the tag tells the kind of current (primary, d.c., or secondary) and where it feeds.

A series of maps is maintained for office records

* J. M. Buswell, San Joaquin Light & Power Corporation, chairman. M. S. Slaughter, The Southern Sierras Power Company, vice-chairman. California Oregon Power Company: S. M. Bullis. Great Western Power Company: G. W. Lyons. Holophane Glass Company: G. C. Rucker. Los Angeles Bureau of Power & Light: W. L. Smith. Los Angeles Gas & Electric Corporation: P. F. Melnick. Pacific Gas and Electric Company: S. C. Dickinson. C. A. Jordan. San Diego Consolidated Gas & Electric Company: W. E. Richmond. E. D. Sherwin. Southern California Edison Company: L. L. Dyer. S. C. Haver, Jr., D. J. Kennelly. The Southern Sierras Power Company: F. V. Wright. Westinghouse Electric & Manufacturing Company: P. B. Garrett.

showing the manholes and duct lines, also the primary, secondary and d.c. A record of manholes, with walls developed showing the number of ducts in a conduit section and service pipes leaving each wall also is maintained in the office.

The fifth company uses aluminum tags fastened to the cable with copper wire. Only primary cable, d.c. feeders and high-tension cables are tagged. Most cables are traced from a known point if doubt arises.

A map showing all cables in the ground is maintained in the office for record.

Conclusions

1. Identification often can be simplified by so building the duct section that each kind of current could have its allotted space and ducts. Thus in a 12-duct conduit system built 3 deep and 4 wide, the bottom row could be allotted to primary, the top to secondaries, and the middle row to d.c. cables. Direction also often helps to identify the destination and therefore to complete the identity of a cable. This method, however, is practical only in a newly designed underground system.

2. Standardization of cable size and kind is a very good aid to cable identification. For instance two 500,000-circ.-mil single-lead conductors and one 4/0 W/P wire in one duct would designate 110-220-volt a. c. Two 750,000-circ.-mil single-lead conductors and one 500,000 circ.-mil bare copper in one duct would designate 110-220-volt d.c., etc. This method, too, would work only on a new system and where there is a concentrated load; otherwise it would mean a great expense for idle copper.

3. Painting stripes around the cable at conspicuous points in the manholes would aid in the finding of cables, especially where congested conditions prevail. For instance, red stripes around a cable to represent 500-volt d.c., yellow stripes to represent 220-volt d.c., blue stripes for 220-volt a.c., etc. This method would necessitate a constant inspection and repainting of all cables reused for a different current.

4. The above to be used in conjunction with the tags which carry the full information of the cable, as these are the only aids to identify the particular cable wanted. It is a fact that in a congested manhole where cable is nicely racked, the tags may not be legible except at close range and they often are in a position where one cannot get close enough to read them without removing the cable from the rack. Therefore the tags must be as legible and as lasting as possible and properly placed.

5. A tag should be placed at the time a cable is spliced, indicating the size of cable, kind of current, voltage, circuit number, source and destination; using a code system rather than printing or stamping all of the information on the tag. Where more than one company occupies a manhole each company should have a distinctive size of tag. Standard shapes of tags may be employed to designate different voltages and perhaps different kinds of current such as a.c. or d.c.

For tie lines between stations, letters corresponding to the source and destination stations together with the circuit number placed between these letters, seem to complete the requirement.

For main feeders the left-hand letter or digit can represent the station of origin, the second character a number representing the circuit and the third character represent possibly the direction or the zone or territory served.

A fourth digit character can be placed on a cable to represent the conductor used in the circuit where the circuit conductors are separate cables. Where it is desired to indicate the size of cable on the tag this may be accomplished by a character at the bottom of the tag, below all the others.

The splicer should attach the proper tag to the proper cable at specified and conspicuous locations. A report of the completion of the work, describing the tag, then should be returned to the office. After a circuit has been spliced and completed an inspector well trained for this work should be sent to inspect the splices and check the information on the tags. The original reports of the splicers should be recorded in the office daily and these records subsequently

checked by the inspector's report. All cutovers or any necessary disturbance of splices or circuits should be handled in the same manner.

6. A systematized method for duct designation should be adopted. Several companies now are using a simple system of 2-digit numbers, the first digit representing the ducts from top to bottom and the second digit representing the ducts from left to right. For example, 22 indicates the duct in the second row down and second row from the left. Reference of course must be specified. Sometimes a prefix indicating the direction referred to is used, as E-22 meaning looking east. Another method similar to the above is to use letters for direction from top to bottom, and numbers for ducts, counting from the curb, on horizontal layers. For example, B2C indicates, B second row down and 2, second duct from C curb. In this system manner of facing is unimportant except for corner holes where streets must be specified.

7. A simple but complete record to be kept in the office with perhaps pocket-size sectional reproductions for field use. This record should show clearly and completely all duct sections and the developed wall arrangement of manholes; should show the duct designation, information concerning the number and kind of cables in each duct, cable designations, and the date of cable installation.

Data on the character of cable and its specifications together with dates of installation and other such information are valuable for engineering reference and also are necessary for accounting purposes at the time a cable is retired or replaced. On the up-to-the-minute accuracy of this record depends safety to the workmen as well as accuracy of engineering and accounting. It even is recommended that proposed work as well as completed work should be entered in such a record, but clearly distinguished as such.

8. A system adequate for the purpose should be established for accurately checking the tags placed on cables in manholes and for the maintenance of the same, for checking the entries in the records, and to insure that all tags and entries will be completed and check through not later than the end of the day following that on which a splice is made.

Apparatus and Devices

By P. B. GARRETT

Appreciation of the merit of apparatus and devices which make for increased safety is best evidenced by constant development, within the electrical industry, of new apparatus of this nature. Nearly every new electrical installation of appreciable size will be found to incorporate at least a few new safety features. In addition existing safety devices are being constantly improved.

One company reports the development of an interlock on its 60-kv. and 100-kv. potential transformers, that insures opening of the low-tension side when the high-tension disconnecting switches are opened to replace blown fuses. This is accomplished through the use of an auxiliary switch on the operating rod of the high-tension disconnecting switch, through which auxiliary switch the low-tension circuit is run. See Fig. 1.

In addition that company has developed a grounding switch for use on the transformer side of the high-tension oil and disconnecting switches that is so interlocked that it cannot be closed unless the latter are open.

A new type of insulating mat for use in generating stations and substations is being tried out at this time. This mat consists of suitably sized strips of battelship linoleum ¼-in. in thickness. This material is buff in color and can be obtained in strips 6 ft. in width and up to about 120 ft. in length. These mats are glued down and thus held permanently in place.

Certain disadvantages have been thought to exist in regard to linoleum mats. Among these is rotting due to moisture from a cement floor which has moisture under it. If the linoleum is cemented to the floor with the proper cement, moisture will not come through it and the linoleum will be protected. On the other hand, if the linoleum is not to be cemented, it can be treated on the under side with an insulating

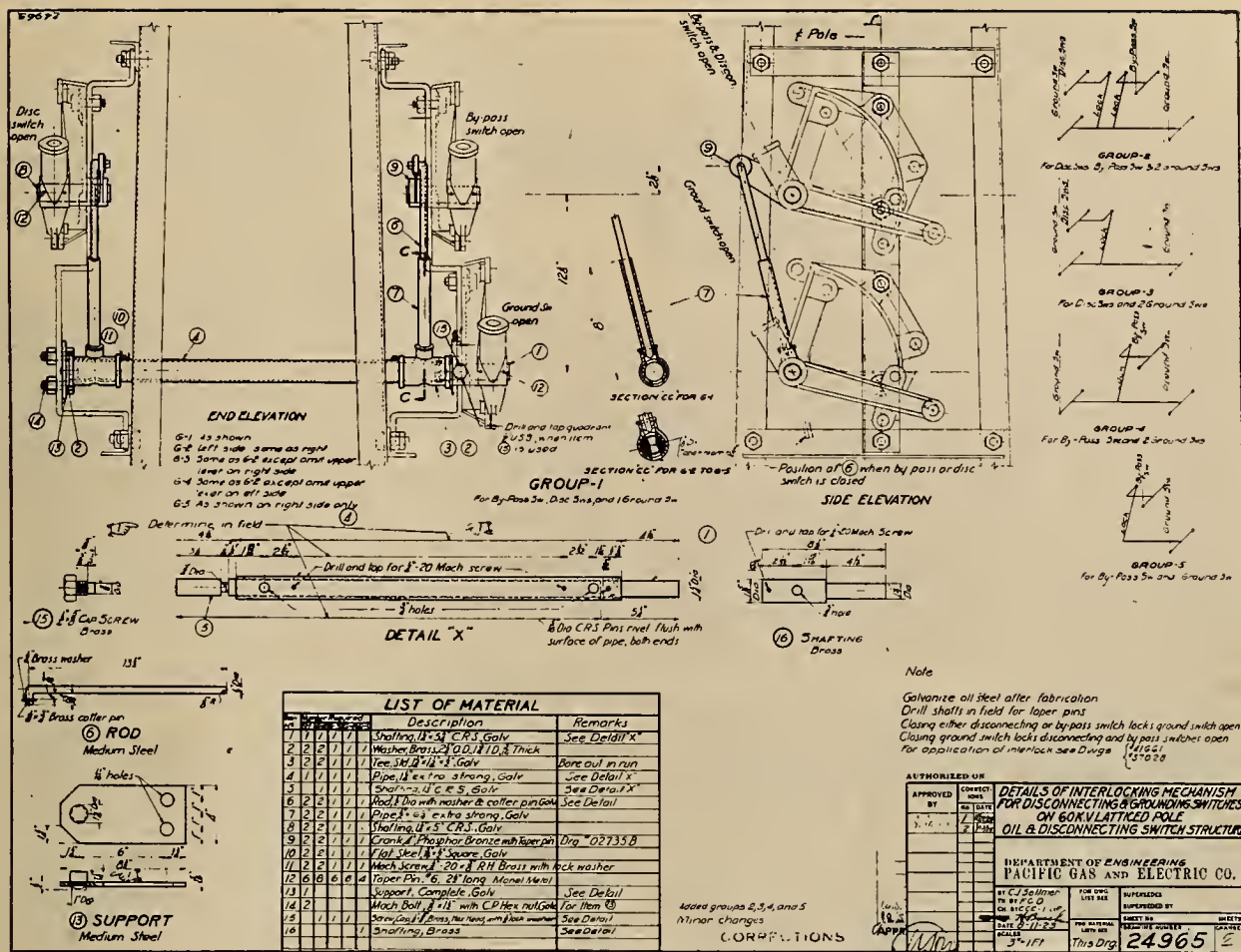


Fig. 1. Details of safety interlocking mechanism.

and moisture-proof coating which will protect it reasonably. In any case the linoleum should be treated on the top surface so as to keep dirt and moisture, from the top, out and also to make it easier to keep clean, and this matter of cleaning was supposed to be a disadvantage.

A very good form of wooden mat is made up of hard-maple insulating strips doweled together and constructed with beveled edges. The absence of any bolts or screws eliminates any possibility of an operator tripping upon any such that might be projecting from the surface.

The enclosing of switches having exposed live parts goes on steadily. When ventilation is important a transite board is mounted on supports and arranged to cover the front of the switch, but leave it open on all sides. Double-throw knife switches are equipped with circular shields that leave only the operating handle exposed.

In some cases the covering of exposed live buses in the rear of switchboards is accomplished with strips of micarta board, cut to proper size and usually either L or channel-shaped. This makes a very attractive protective covering.

There is a very live demand among the operating companies for some kind of an instrument or device for "detecting" or "proving" a conductor to insure that it is dead before grounding it. Likewise there is the need of a device to indicate approximately the voltage of a circuit or whether the current is alternating or direct. In this regard it should be pointed out first that no safety device that has any possibility whatever of failure should be used in this manner.

The use of indicators of this type was started first about four years ago when the Neon tube indicator known as the Spark-C was brought out. At that time an investigation was made of the Neon tubes as indicators for use on high-voltage transmission lines and high-voltage bus bars. Tubes using this principle as made up in a research laboratory were very successful. The design then was turned over for pro-

duction on a commercial basis. It was found that they were all right until such time as the vacuum in the glass tube was lost. Loss of vacuum is caused by the burning of a hole in the glass; that in turn is found to be due to the use of Neon which has not been suitably washed.

As a result it has been decided that these tubes should not be used as safety devices, but merely for indicators. They are used today for bus-bar indicators eliminating high-potential transformers. Although these tubes are not positive indicators, likewise the high-voltage potential transformer is not an absolutely positive indicator as the winding may become open-circuited, in which case a bus is indicated as being dead when it is not. A gold-leaf electroscope sometimes is used as an indicator for this same purpose, but again it is not an infallible device.

About eight years ago a high-voltage indicator was brought out consisting of a set of vanes on the end of a stick. These vanes were held in the vicinity of the line in question and if the line were "hot" the vanes rotated due to the electrostatic field. This device was a failure because friction developed in the bearing of the device and the vanes would not rotate when they should. This, of course, also gave a false indication as to a line being dead when it was not.

Another indicating device for lower voltages makes use of resistances in series with lamps. As a safeguard against false operation of this device two lamps are used, connected in parallel. It has been suggested that if test lamps are used they should be housed in fine wire-gauze cages or in housings provided with narrow slits through which the lights can be seen.

The "buzz-stick" method is considered to be one of the surest methods of testing a line to ascertain definitely whether it is or is not energized.

Regardless of the device used to test a conductor for potential it is recommended that where possible the device be applied to a known live conductor, as a check on its operating condition, both directly before and directly after making the test on the conductor in question.

Safe Practices for Operating and Construction Forces

By W. L. SMITH

A review of requirements shows a general demand for a statement of what is the best practice for the following: placing and removing temporary protective grounds on high-voltage conductors, underground work, and tree trimming. Also safe practices for the elimination of minor accidents and provision for penalties for violation of rules and safe practices are desired.

Placing and Removing Temporary Grounds

The party about to do work on lines, buses or equipment must call for clearance from load dispatcher or system operator, thus placing the operation on record. Station operators usually act as representatives of the dispatcher. On overhead transmission and distribution lines the foreman or patrolman may act as such representative.

After the necessary switching has been completed and checked to see that all necessary switches are opened Men at Work or Men on the Line tags should be placed on controls of all switching gear and the permanent station grounds closed where provided. The representative should inform the party doing the work that he must place his own short and ground at the point where the work is to be done before starting the work.

The workmen then must proceed by making a test with a switch hook or some instrument of that character by touching the conductors and observing whether or not there is a snap which indicates a hot conductor. This test operates satisfactorily for voltages above 6.6 kv. For voltages below 6.6 kv. this is not a very reliable method, the "snap" not being pronounced enough. Other indicating devices are recommended such as those employing the familiar spark plug testing tube which glows when placed near a live conductor. A suitable handle must be used, of course, for any such device.

In using any of these devices it is recommended that either the arrangement in duplicate should be used or the instrument used should be checked to a known live conductor before and after exploring the conductor being checked. This is for the purpose of making sure that the device is working and to assure that it doesn't give a false result.

In placing temporary grounds on conductors to be grounding is a flexible cable with one end connected to until they have been securely grounded. For protection workmen should stand well below or to one side of the part to be grounded in order to keep away from any arc that may arise in case the bus or line should be charged when the ground connection is being applied. In all cases the grounding cable must be satisfactorily attached to ground before the clamps are taken to the conductors and in removing grounds detachment must be from the conductors first.

The arrangement recommended for temporary grounding is a flexible cable with one end connected to any approved clamping arrangement for connecting to a permanent station ground, water pipe, or tower frame which is known to be grounded to earth. On the other end of the cable is provided a clamp mounted on an insulated handle of any desired length. This clamp is so arranged that when it is hooked onto the line it may be screwed up tight to eliminate the possibility of its becoming unfastened and in order to improve the contact.

In isolated locations such as on lines or in stations in the country or where there is no regular operator it is recommended that two experienced men work together in the placing of temporary grounds. One should station himself sufficiently far away so that: first, he will probably not have just the same thoughts as will the man actually doing the switching; second, from his wider range he can see more of the structure and can better check what the operator is about to do; and third, so that he would not be involved if an arc is caused, but will be safe and able to render assistance.

It has been recommended that where megger or other testing is to be done, requiring that the conductors or devices be ungrounded at the time, the

above procedure should be completed and the temporary grounds removed only during the actual period of the megger or other type of test, the temporary grounds re-established, then, immediately afterwards and maintained until all the work is completed, after which, of course, the grounding devices are removed, first from the conductors, and finally the dispatcher or system operator notified in the usual manner and the entire procedure recorded in the log books.

Underground Work

It is recommended that before work is done on underground cable in a manhole or tunnel either a spike or wide chisel mounted on a long handle be pushed through the cable to prove it dead. The wide chisel as compared with the spike is considered a more positive check unless the spike definitely shows copper on its sides. The chisel should be equipped with a boot as a protection when it is not in use.

The required use of hose masks is recommended for entrance to smoke or gas filled compartments or manholes. The use of a mask supplied through a sufficient length of hose from a pump has been found to be satisfactory.

The practice of employing two experienced men in underground work is recommended especially where there is primary-voltage bus work located in manholes.

Tree Trimming

The following suggestions are offered for the safety of employees engaged in tree trimming in close proximity to high-voltage lines:

1. Men should be required to use safety belts and climbing irons and not depend upon the security of limbs to either climb or stand on. The climbers recommended for soft wood or thick bark should be about 17 in. long with 4-in. gaffs. The safety belt should never be placed around the limb or part of the tree to which the hand line or other rope is attached.
2. The standard tree pruners should be equipped with operating rods of an insulated material rather than the ordinary metal rods.
3. Where a cut is to be made on a limb or trunk of large diameter the operation can be done safer to the employee and with less injury to the tree itself by lashing or binding on either side of the place where the cut is to be made.
4. At least two or more experienced men should work together in carrying out the operation, depending on conditions.
5. Any branch that is lying against a primary line of 2,200 and 4,400 volts should be first pulled away before being cut. In a case of cutting limbs away from lines of voltages from 10 to 33 kv. a clearance from the load dispatcher should be obtained.

Elimination of Minor Accidents

Constant attention of the management to those details which tend to eliminate waste or inefficiency also will eliminate those conditions which cause accidents. Good housekeeping in all departments, especially in the shop, warehouse, substation or on construction work is an important factor. This means constant inspection and constant appeal and instruction to men.

It has been found by those companies that provide first-aid kits in all quarters, and especially on all line trucks, that to emphasize minor injuries by requiring the foreman and straw bosses to see that every minor injury is given first aid treatment (iodine if nothing else), and that they be covered by accident reports so focuses attention onto even minor injuries that the men avoid them whenever possible if for no other reason that to eliminate the bother.

The use of laminated-lens goggles is imperative on all work where there is a possibility of flying particles lodging in the eyes. Notices should be posted in permanent form at all emery wheels to convey to the workmen the necessity and rules for wearing goggles.

The requirement by all companies of physical examination at least of employees engaged in dangerous work will go a long way toward the elimination of accidents.

Penalties

The public utility finds it necessary to provide safeguards and protection for its employees in the carrying out of hazardous work. Lest there should be any wilful disregard on the part of the employees toward this safeguarding, definite penalties for violation of certain fundamental and highly important practices have proved successful. These are generally stated in the rule book and involve dismissal, demotion and other penalties. For violation of less vital but nevertheless important rules it should be stated in the

rule book that penalties may be imposed, in order that chronic violators may expect to be penalized.

General Safe Practices

Engineering and purchasing departments of the public utility should include in all specifications for machinery and equipment that such machinery or equipment must be provided with proper safeguards and that before such machinery or equipment is accepted by the company it shall have an inspection relative to its proper safeguarding.

The Foreman

By W. E. RICHMOND and E. D. SHERWIN

The position of the foreman in industry, with regard to safe practices, is much like that of the school-teacher in relation to the community. His influence over workmen is exactly that of teacher over pupil, but with more authority than the teacher. His responsibility to the management is precisely that of the teacher to the community for upon his understanding of and belief in what he teaches depends the results accomplished by workmen at his command. Results attained by foremen are proportionate to their correct application of their knowledge to the situation they control.

Foremen are deliberately chosen because of their possession of ability to apply requisite knowledge to practical ends. Thus when the management decides that workmen shall be taught to discard old and adopt new habits of thought and action the foremen are depended upon to effect the desired changes.

Experience has demonstrated amply that accident-prevention and first-aid measures rightly carried out will pay dividends. Hence it becomes desirable for foremen to acquire knowledge of one and of its application to produce the other. This calls for instruction of foremen to the extent that they shall influence their workmen to observe habitual obedience to rules and in turn to be receptive to instruction and its application.

To develop and maintain habitual safe practices and proper rendition of first aid involves the selection of instructors who will impress on foremen: first, the humanitarian aspects; second, the money or economic value to the workman; third, the money or economic value to the company of stopping accidents; fourth, the commonsense attitude that it pays from any and every point of view to form habits of safety.

The foremen must secure attendance of workmen at class instructions.

When both foremen and workmen have received instruction persistent effort must be directed toward keeping up interest always. Methods for doing this vary, but may include:

1. Class work, committees, meetings, contests, examinations, prizes.
2. Use of house organs and bulletins.
3. Issuing of first-aid and safety rules, instruction books and other printed matter.

In actual practice of first aid the necessity for immediate attention to slight injuries is the most difficult thing to get workmen to realize. Here, the foreman's right attitude is invaluable. The new employee also must be brought into line.

Safety habits once fixed lend their tone to the establishment just as carelessness is noticeable or slovenliness is a marked characteristic of some plants. The properly trained foreman who breaks rules should be penalized. The same for workmen. Rules should not apply to men not capable of obeying them.

How many firms know whether or not their foremen and workmen can apply instruction if given them? How many know, have records in black and white showing what has been done and who has been instructed and how well? Examine them and then make your rules to fit.

Safety Bulletins

By M. S. SLAUGHTER

Emerson says nine-tenths of our education is received through the eyes. Accepting this as true, no other medium offers the opportunity for education in accident prevention work that is presented in safety

bulletins. To be effective these bulletins must carry a message that is pertinent to the industry and easily understood by the employee to be reached. The most attractive size is 8½x11 in., with reading matter very brief and presenting a single thought.

The bulletin idea is growing rapidly and numerous sources of supply are available. Those prepared by the National Safety Council, various insurance companies and power companies present a wide choice of good material. The first offers the best selection of appropriate matter at the most reasonable cost and is the prevailing choice of member companies.

The use of company designs exclusively is very attractive and offers opportunity to follow up educational work of a special nature, but is not available to the smaller companies which have no personnel department to properly prepare the bulletins. To these companies the use of locally prepared bulletins of a cartoon or special nature, as an auxiliary, may be enlarged as facilities and supervision permit and will increase the value of the safety-bulletin education.

Interest manifested by employees is very favorable to well selected bulletins and the effectiveness is observed in the care exercised by all classes of employees in following the message delivered. This interest is greatly increased if the bulletins are conspicuously posted on well designed bulletin boards and changed at regular intervals, preferably every two weeks, by someone specifically designated to care for this work.

Safety bulletins hold a high position in accident-prevention education and it is important that due consideration always be given to any improvements in design and methods of handling, in order to maintain proper interest of the employees.

Tools

By J. M. BUSWELL

The purpose of this paper is to present for the benefit of member companies any tools or appliances that may have been developed on any of the systems to promote safe and efficient operations. It is true that we cannot furnish the prime requisites among tools, namely, eyes that see and brains that always think first. Still we may develop these in the individual by education. By attention to tools we can help secure safe working conditions.

Many times appliances are avoided or mistrusted by the men because of some defect in design or construction. If those in charge of accident prevention will familiarize themselves with processes of the work they can detect, from their broad knowledge of other cases, the defects in equipment that lead to accidents.

Because of the close contact between the accident prevention man and the entire personnel of his organization he has exceptionally good opportunity to iron out defects or shortages in equipment. He has or he should have the confidence of the men, learning their viewpoint. This close contact is evidenced by the wide variety of ideas submitted in response to our request for data.

To combat the desire of linemen to get their safety belts made as cheaply as possible and in accordance with their own ideas by the nearest harness maker the San Joaquin company developed a standard safety belt and strap, after consultations between its linemen and inspectors. Fig. 1 shows this belt. The following specifications eliminate unsafe materials:

General

All parts shall be of style shown on the attached drawing. All dimensions shall be as shown on the attached drawing. The size of the belt shall be that dimension, stated in inches, from the end of the buckle to the middle hole in the tongue of the belt.

Details of material and manufacture shall be as specified herein or shown on the drawing.

Tests shall be made as specified herein and shall constitute an acceptance test. They shall be made by the purchaser in the presence of a representative of the manufacturer if possible.

Material and Manufacture

Leather in belts and safety straps shall be first-quality genuine oak-tanned leather from northern steers and shall be cut from the backs of the hides only. The minimum thickness shall be 3/16 in.

No splices shall be allowed in belts or straps.

Prevailing Practices

The Los Angeles Gas & Electric Corporation does not permit a lineman to use his own tools. A complete set is furnished him; tools, belts and other necessities are loaned to him while in the employ of the company.

The Pacific Gas and Electric Company is also adopting a policy of furnishing hardware to a man where

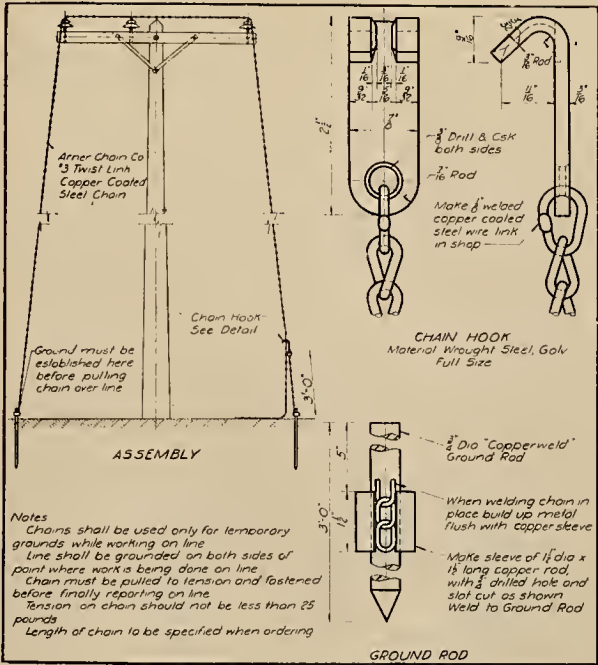
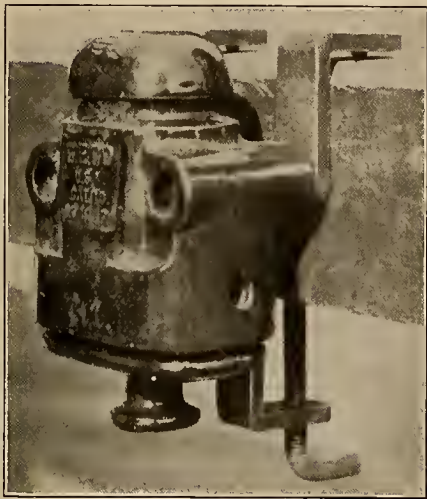


Fig. 6. Grounding practice of Pacific Gas and Electric Company where grounding chain is used.

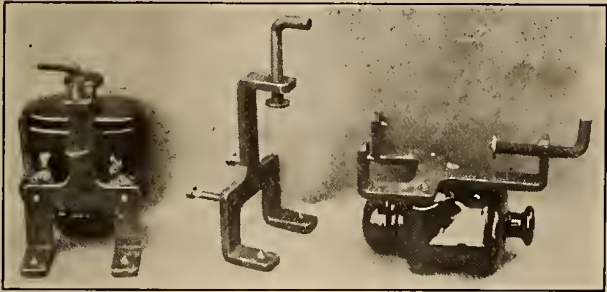


Fig. 4. Below, three views of safety emergency mounting for primary cut-out as developed by the San Diego Consolidated Gas & Electric Company. Above, same mounted on crossarm.

he cannot or will not replace a tool or other equipment that has been condemned.

In other words it is being recognized that it is not sufficient to condemn a man's equipment and leave it to him to get other the best way he can. Substitutions must be taken care of to the man's satisfaction.



Fig. 5. Grounding clamp devised by San Joaquin Light & Power Corporation.

To promote the lineman's confidence in gloves and to insure their constant care and availability some companies issue an individual pair to each lineman. The Southern Sierras Power Company reports that this scheme promotes greater confidence on the part of the men and better conditions of the gloves are noted when they come in for tests. That company's specifications for a bag suitable for hanging on the lineman's belt provide that the bag be made of 8-oz. duck 18x8 in., sewed flat, and pointed flap fastened with a substantial button snap. On the reverse a small swivel hook is fastened.

The question of how often gloves should be tested and to what extent they may be weakened by high-voltage tests is covered in another paper. There is no doubt that a pin prick may not show up in the air test although it may fill up with perspiration. However, many high-voltage tests may do considerable damage by over-stressing the rubber.

Safety Devices

From the Southern California Edison Company comes the reel-clamping device illustrated in Fig. 2. This device is of great value in that it will handle successfully that bug-bear of the line gang, a damaged cable reel.

The Southern California Edison Company also uses the switch-button cover shown in Fig. 3. This slips over the control button on a remote-control switch-board to prevent a switch being closed when clearance has been given beyond the switch.

The San Diego Consolidated Gas & Electric Company uses the clamp for a primary cutout shown in

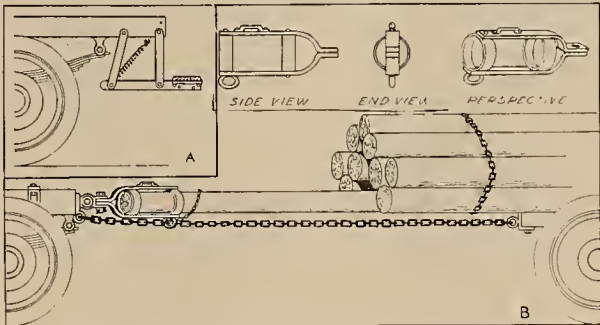


Fig. 7. Above, non-rigid rear step for line trucks; avoids breakage. Center, details of pole-muzzle towing attachment. Below, application of pole-muzzle towing attachment. Equipment devised by Geo. Hamminger of the Southern California Edison Company.

Fig. 4. This was developed as emergency repair equipment to replace the cutout where a failure had burned the arm. The device obviates the dangerous practice of cutting in solid a transformer which perhaps has a damaged winding, but it permits the same speed in restoring service. In this connection discussion among the representatives of member companies develops the fact that use of this type of transformer cutout is fast being obviated.

Fig. 5 shows a type of grounding clamp built by the San Joaquin company and Fig. 6 shows the Pacific Gas and Electric Company practice where a grounding chain is used. This company also makes extensive use of grounding clamps of their own manufacture. Other companies use clamps of outside manufacture.

The procedure in installing grounds is covered in another paper, Safe Practices, but it is well to point out here that the use of clamps gives more safety to the man working behind the grounds. The chain pre-

kept in proper condition. In other words, as with all apparatus, frequent inspection is required.

A form to store the mask on to hold it in a shape similar to the human face will prevent the mask from taking a set in such a shape that it will not fit easily when used in emergencies.

The matter of safe transportation of men and materials occupies the attention of all, and in increasing amount.

The Southern California Edison Company supplies a sketch, Fig. 7, of a flexible step for a truck. This step should not be put out of service due to collisions with the warehouse platforms as regularly as is the rigid step.

From the same company comes the pole muzzle shown in Fig. 7. That device provides a flexible and suitable coupling to a trailer-load of poles.

The Pacific Gas and Electric Company uses the cable-splicer's platform shown in Fig. 8; requiring that belts and safeties be worn where a platform not

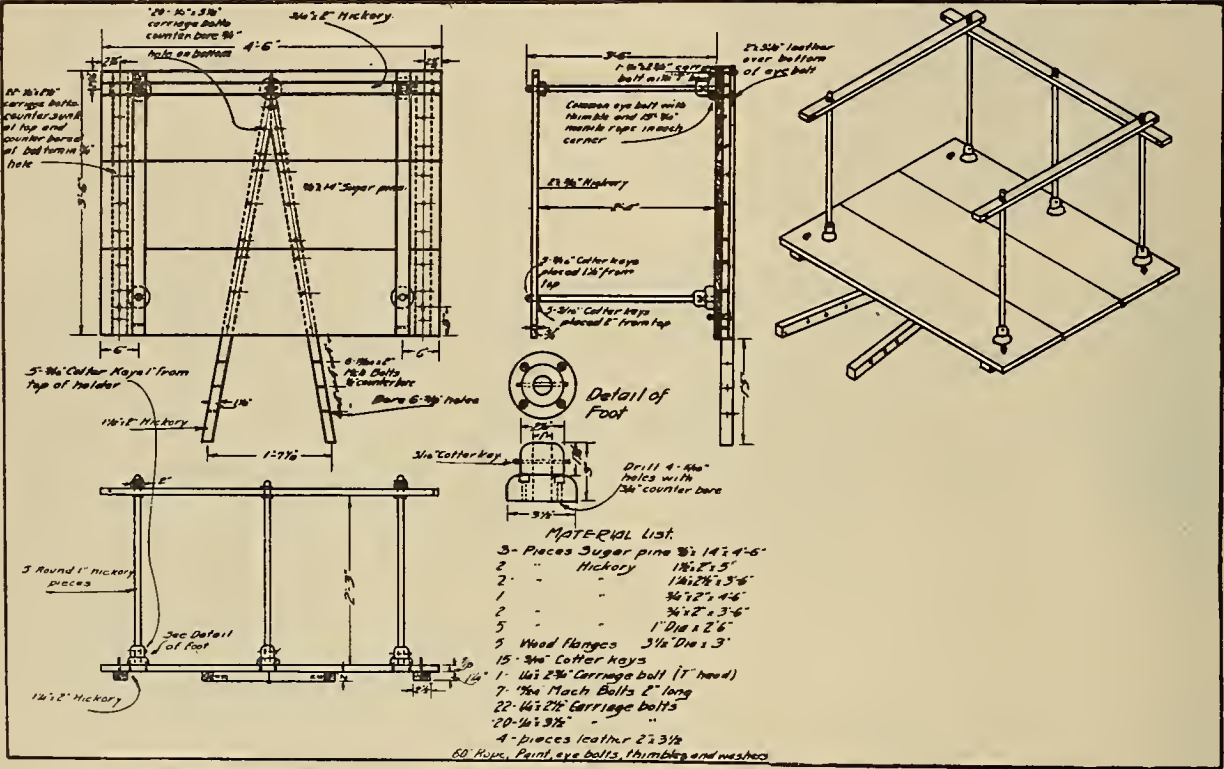


Fig. 8. Cable-splicers' chair designed by East Bay Division, Pacific Gas and Electric Company.

sent the hazard of contact with other lines while being thrown over and also gives only a point contact which a little dirt easily may destroy. Many accidents have resulted from attempts to loosen a caught chain as it is bulky to handle.

Furthermore, the clamp on the end of an insulating handle allows the operator to "feel out" a line to make sure it is not energized, sometimes preventing a burn-down of the line.

To definitely prove out an underground cable before cutting into it, several companies provide a spike or chisel. The Pacific Gas and Electric Company uses a 2-in. steel chisel blade on the end of a 6-foot wooden pole. They require, to be sure that the conductor is contacted to the sheath, that the blade show copper markings upon withdrawal.

In this connection it seems to be the practice of member companies to use hose masks for manhole work where required. This obviates the difficulty due to aging of the chemicals of the cannister types and insures better protection against leakage of gases in around the edges of the mask. The outside pump gives a positive air supply to the interior of especial value if the mask is poorly fitted to the face.

Naturally, for station use the cannister type is required where compartments and corridors must be traversed, sometimes rapidly. In this connection it is pointed out that the harness of the masks must be

equipped with railing such as this is provided. A man is no safer on a platform or dead-end board without belt or railing than he would be on a stepped pole or crossarm. If the splicing tools are provided with hooks and kept hung up there will be no necessity for a toe board around the platform.

In soldering equipment there is a tendency among several of the member companies to supersede the gasoline torch by acetylene. Harnesses have been devised to hold the tank suspended on the crossarm so that the valve always is accessible, the hose nipple protected and the tank pointed away from the men and equipment. In this connection it has been pointed out that a shut-off wrench, preferably of the socket type, should be chained to the tank for emergency use.

It also has been brought out that a non-corrosive soldering paste is safest and easiest to use and that a compartment attached to the gas-tank holder is desirable as a paste container.

Conclusions

In conclusion it cannot be over-emphasized that a prime duty of those charged with accident prevention is at all times to co-operate in the development of new tools and devices for promoting both safety and efficiency. Efficiency and safety go hand in hand and a tool designed for safety nearly always promotes efficiency.

Overhead Systems Committee Reports*

Study of Life of Treated and Untreated Poles

By R. E. CUNNINGHAM**

The subject of the relative life of treated and untreated poles is being considered by several geographic divisions in co-operation with the national overhead systems committee. The following report gives the results of the investigation of the P.C.E.A. subcommittee studying the subject.

In order to obtain figures which would be representative of conditions throughout the entire state of California the subcommittee was composed of members from the following companies: San Diego Consolidated Gas & Electric Company, The Southern Sierras Power Company, Los Angeles Gas & Electric Corporation, Los Angeles Bureau of Power and Light, Southern California Edison Company, San Joaquin Light & Power Corporation, and Pacific Gas and Electric Company.

Probably these companies have a total of approximately a million wood poles in service. To attempt to investigate and report on all these poles would be impracticable. It was decided, therefore, that each member would select certain lines of poles the history of which was known and which were fairly representative of conditions in the respective locations, and inspect same. A compilation of all such reports should

were set untreated while in more recent years they have been butt-treated by the open-tank method. Some of the companies have used a few poles of native cedar, pine and tamarack, but the supply of such poles is limited and the life has been short so that a report on these would not be of material value.

During the war period some use was made of butt-treated Douglas fir. In view of the very large supply of this timber in the Northwest and the possibility of using it full-length pressure-treated the results obtained thus far should be of interest.

Before presenting the reports of the various companies attention should be given to a special test of treated and untreated western red cedar conducted by the U.S. Department of Agriculture, Forest Service, which began prior to 1909. This is the most valuable and authentic record we have on this matter, as the experiment has been under the direction of government experts from the beginning and most careful records of seasoning, treating, inspections, etc., have been kept.

Forest Service Report

The preliminary report of the 1925 inspection has just been received and is as follows:

In 1907, 1908 and 1909, 891 experimental 35 and 40-ft. western red cedar poles were set in and around Los Angeles in the lines of the Los Angeles Gas & Electric Corporation, Pacific Electric Company, Southern California Edison Company, Home Telephone Company (now the Southern California Telephone Company), and

TABLE I.—Condition of experimental western Red Cedar poles in and around Los Angeles after about 16 years service. Results of 1925 Inspection*

Preservative	Treatment (Butts only)	Condition	No. of poles			Sound		Partly decayed		Removed on account of decay	
			Set	In test	Eliminated**	No.	Per Cent	No.	Per Cent	No.	Per Cent
Carbolineum.....	Brush.....	Seasoned.....	59	31	28	2	6.4	18	58.1	11	35.5
Creosote.....	Brush.....	Seasoned.....	68	29	39	1	3.5	17	58.6	11	37.9
Creosote.....	Open tank.....	Seasoned.....	471	244	227	184	75.4	55	22.5	5	2.1
Crude Oil.....	Open tank.....	Seasoned.....	5	..	5	..	..	..	..	..	..
Zinc chloride.....	Open tank.....	Seasoned.....	175	76	100	1	1.3	60	79.0	15	19.7
Zinc creosote.....	Open tank.....	Seasoned.....	56	34	22	5	14.7	24	70.6	5	14.7
.....	Untreated.....	Seasoned.....	56	32	24	..	..	15	46.9	17	53.1

*U. S. Department of Agriculture, Forest Service, Forest Products Laboratory, Madison, Wisconsin, January 18, 1926.
**Eliminated on account of removal for new construction without record of disposal; poles set too deep; set in cement or other places where a careful inspection could not be made; burned; broken by accident, etc.

give a fair average of results obtained throughout the state.

Practically all poles used by the Pacific Coast companies have been western red cedar from Oregon, Washington and Idaho. In earlier years these poles

the U.S. Long Distance Telephone and Telegraph Company. In 1922 the city of Los Angeles, through its Bureau of Power and Light, took over the city lines of the Southern California Edison Company, and now is maintaining the experimental poles in those lines.

Experimental seasoning and treating were conducted at Wilmington, Calif., by the Forest Service in co-operation with the various companies. The poles were cut in northwestern Washington and were about seasoned upon arrival at Wilmington. There they were seasoned for an additional three to nine months before being treated. Both open-tank and brush treatments were used.

Average absorptions with the different treatments may be found in the accompanying analyses of the preservatives in the appendix. (Table and analyses not shown in this report.) The creosote was purchased as a coal-tar derivative, but tests of specific gravity, index of refraction, and sulphonation residues indicate that it was a water-gas tar product.

Inspections of the poles were made in 1910, 1911, 1912, 1913, 1916, 1920 and 1925. The results of the first five inspections never have been published. The 1920 inspection results were discussed in Mr. Hicks' paper, and the results of the 1925 inspection will be presented here.

Although 891 poles were set originally, data for only 446 are summarized in Table I, 445 having been eliminated from the study; some because they were destroyed, others because they were set too deep, that is with the ground line above the treated area, others because they were set in concrete making it impossible to inspect them thoroughly, and still others on account of new construction and changes in lines. It is for the last-named cause that the highest percentage of poles has been eliminated. The growth of Los Angeles since the establishment of the test lines has been very rapid and the companies have had to make many changes in their old lines and construct many new lines. The result is that a large number of the experimental poles have been removed without record having been kept of their condition or disposal. For instance, during the summer of 1922 the pole line of the U.S. Long Distance Telephone and Telegraph Company extending from Los Angeles to Whittier was replaced by underground cable. About 167 experimental poles were eliminated as a result of this change.

Tank creosoted poles were found in the best condition. About

* G. A. Riley, Los Angeles Gas & Electric Corporation, chairman. R. E. Cunningham, Southern California Edison Company, vice-chairman. California Oregon Power Company: S. M. Bullis, R. S. Daniels. Coast Counties Gas & Electric Company: W. R. Van Bokkelen. Coast Valleys Gas & Electric Company: T. W. Snell. General Electric Company: W. C. Smith. Great Western Power Company: G. H. Hagar, J. A. Koontz. Garland-Affolter Engineering Company: A. E. Garland. Los Angeles Bureau of Power and Light: M. O. Bolser, H. L. Caldwell. Los Angeles Gas & Electric Corporation: F. E. Dellinger, C. B. Judson, E. R. Northmore. Los Angeles Joint Pole Committee: J. E. Macdonald. W. N. Mathews Corporation: B. C. Holst. Midland Counties Public Service Corporation: D. D. Smalley. Nevada-California Power Company: R. H. Ingersoll. Oakland Joint Pole Committee: E. C. Fisher. Ontario Power Company: C. W. Walker. Pacific Gas and Electric Company: H. H. Buell, N. P. Carlson, L. J. Corbett, S. J. Lisberger, W. R. Muller, W. D. Skinner, E. H. Steele, A. J. Theis, J. O. Tobey, Roy Wilkins, C. E. Young. Pacific States Electric Company: H. R. Noack. The Pacific Telephone & Telegraph Company: D. I. Cone, R. W. Mastick. San Diego Consolidated Gas & Electric Company: K. B. Ayres, A. S. Glasgow, P. C. Hatch, C. L. Lawrie, C. C. May. San Joaquin Light & Power Corporation: E. R. Banks, H. H. Minor, A. S. Walthal. Southern California Edison Company: R. G. Boyles, J. C. Carey, N. B. Hinson, F. C. McLaughlin, J. H. Mead, E. R. Stauffacher. The Southern Sierras Power Company: H. H. Miller, F. D. Morgans, E. Y. Porter, A. C. Putnam, F. V. Wright. Western Electric Company: J. E. Crilly. Westinghouse Electric & Manufacturing Company: S. L. Case, J. M. Morris, H. A. Wegener.

** Report of Subcommittee. R. E. Cunningham, chairman; K. B. Ayres, E. R. Banks, F. E. Dellinger, H. L. Caldwell, N. B. Hinson, R. W. Muller, E. Y. Porter, J. O. Tobey.

75 per cent of them showed no decay at or near the ground line after 16 years service, and only about 2 per cent had been removed on account of decay.

Poles treated with zinc-creosote were in better condition than those treated with straight zinc chloride. No appreciable difference existed in the condition of the poles brush treated with carbolineum and with creosote although both groups were in poorer condition than any of the other treated poles. About 53 per cent of the untreated poles had been removed on account of decay and those still in service were decayed to some degree.

A factor which appears to be at least equal in importance to decay in affecting the life of untreated and butt-treated poles in southern California is the attack of termites on the untreated areas. A high percentage of the experimental poles are so affected to some extent. It was possible to observe carefully the condition of the poles only for a distance of about 8 ft. above the ground line except when the poles of the Southern California Edison Company were inspected and a lineman was detailed to assist. From the results of inspections and observations it is believed that a high percentage of the butt-creosoted poles eventually will be removed not on account of decay at and near the ground line, but on account of termite attack above this area. It is quite likely that the same will be true for the poles butt-treated with zinc chloride and zinc-creosote, but most of the untreated and brush-treated poles probably will be removed on account of decay or a combination of decay and termite depredation.

With the termite as active as it is at the present time in southern California, the consumer will be practicing poor economy to use a good butt treatment, such as the open-tank creosote treatment for instance, and fails to provide protection for the top. If, however, only a brush treatment of the butt is used it appears a mere extravagance to treat the tops as the butts probably will be rotted through before or at least as soon as the top is severely damaged by the termites.

San Diego Consolidated Gas & Electric Company Report

In speaking of untreated poles those to which no treatment of any kind has been applied are indicated.

Creosote-brushed means creosote painted on with a paint brush; a method of application that gives very little penetration.

Creosote-tanked means that the poles have been

Height—
12 poles, 50 ft.
21 poles, 60 ft.

Top Size—
1 pole, 9 in.
24 poles, 8 in.
7 poles, 7 in.
1 pole, 6 in.

Variety—
18 poles, Douglas fir.
15 poles, red cedar.

Treatment—
9 cedar poles, lime mortar.
5 cedar poles, creosote-tanked and lime mortar.
15 fir poles, creosote-tanked and lime mortar.
1 cedar pole, creosote-brushed.
3 fir poles, creosote-tanked.

Soil—
12 poles, sand and gravel, or loam.
15 poles, rock and adobe.
6 poles, adobe.

Life—
21 poles, 10 years (plus) estimated.

Four poles, 50-ft. red cedar with 8-in., 8-in., 7-in. and 6-in. tops respectively; lime-mortar treated; set in soil composed of sand, gravel and loam; infested with termites and rot; in very poor condition and should be changed at once.

Five poles, 50-ft. red cedar with 9-in., 8-in., 8-in., 8-in., and 7-in. tops respectively; lime-mortar treated; set in soil composed of sand, gravel and loam; three infested with termites and rot and two with dry rot; remaining life estimated at six or seven years.

One pole, 50-ft. red cedar with 8-in. top; creosote-tanked and lime-mortar treated; set in soil composed of sand, gravel and loam; infested with termites and rot; remaining life estimated at six years.

One pole, 50-ft. red cedar with 7-in. top; creosote-tanked; lime-mortar treated; set in soil composed of sand, gravel and loam; infested with termites and rot; remaining life estimated at two years.

TABLE II.—Data on life of western Red Cedar poles treated with creolineum applied on butt with brush, or cold dipped.—Southern Sierras Power Company.

Name and Location of Line	Year Built	Total No. of poles	Normal size	Stubbed prior to 1920	Stubbed between 1920-24	Stubbed 1924 No.	Stubbed 1925 No.	Replaced with new poles prior to 1925
Riverside-Glen Avon-Corona Line, Iowa & Columbia St., to Corona Sub.	1912	691	35'x8"	74	34	49	5	20
Bloomington Line from S. B. Steam Plant to Declez, pole B-310.	1912 & 1913	312	35'x40'x7"	14	20	22	9	1
Riverside-Perris-Elsinore Line from 8th St. Riverside to Elsinore sub.	1913	958	35'x8"	15	41	60	14	1
Perris-San Jacinto-Hemet Line from Lakeview B-206 to Hemet B-640.	1912	439	35'x8"	11	15	18	8	1
Redlands Line & Imp. Valley Line from Steam Plant to Redlands sub.	1913	351	50'x8" and 40'x8"	0	20	8	3	0
Arlington Line from Glen Avon sub. to Arlington.	1913	170	40'x8"	8	6	4	1	0
Lytle Creek Line from S. B. Steam Plant to B-146.	1913	148	40'x8"	5	6	11	5	1
Wineville Line from Pole B-499 of Corona Line to Chas. Stern & Co. sub.	1912	81	40'x8"	13	8	10	1	0
Totals.	..	3150	..	140	150	182	46	24

Total poles stubbed or replaced to date 542 or 17.2 per cent.

TABLE III.—Data on life of Western Red Cedar poles creosote "B" open-tank treatment.—Southern Sierras Power Company.

Name and Location of Line	Year Built	Total No. of poles	Normal size	Stubbed prior to 1920	Stubbed between 1920-24	Stubbed 1924 No.	Stubbed 1925 No.	Replaced with new poles prior to 1925 (probably fire)
Corona-Elsinore Line (Temescal Canyon) from B-1033 to B-1333.	1917	309	40'x8"	0	3	2	0	16
Liberty Ranch Line, Perris Valley from Elsinore Line B-903 to Liberty Ranch.	1917	130	40'x8"	0	0	0	0	0
Declez-Glen Avon Tie Line from Declez pole B-310 to Glen Avon.	1916	110	40'x8"	1	0	2	0	1
Muscupiate Line from Pole B-68 of Cajon Line to Muscupiate sub.	1918	27	35'x7"	0	0	0	0	0
Totals.	..	571	..	1	3	4	0	17

treated to a height of about 8 ft. above the butt by standing upright in a tank of imported creosote heated to a temperature of from 250 deg. to 300 deg. F., and allowed to remain from 16 to 18 hours, the creosote being allowed to cool during this time. Penetration due to this treatment on red cedar is approximately 1/2 in.

The lime-mortar treatment is a mortar made of lime, sand and rock, applied to a depth of about 3 ft. below the surface of the earth, forming a jacket around the pole similar to the cement jacket applied for reinforcing purposes, but of course having no reinforcing irons.

Inspection Results

December 15, 1925, 33 poles set in 1917 and located on Thirty-second Street, San Diego, and in Camp Kearny Mesa, north of Mission Valley.

One pole, 60-ft. red cedar with 8-in. top; brush-treated with creosote; set in adobe and rock; infested with termites and rot; remaining life estimated at seven years.

December 14, 1925, 38 poles set in 1918 and located north of Oceanside and south of Las Flores.

Height—
35 poles, 50 ft.
2 poles, 55 ft.
1 pole, 65 ft.

Top Size—
11 poles, 7 in.
20 poles, 8 in.
2 poles, 10 in.

Variety—
24 poles, Douglas fir.
14 poles, red cedar.

Treatment—
23 fir poles, creosote-tanked.
1 fir pole, creosote-brushed.
13 cedar poles, creosote-tanked.
1 cedar pole, not treated.

Soil—

- 9 poles, sandy clay.
- 2 poles, gravel and loam.
- 11 poles, loam.
- 7 poles, heavy loam.
- 1 pole, sandy loam.
- 2 poles, adobe.
- 1 pole, adobe and rock.
- 5 poles, silt.

Life—

- 31 poles, 10 years (plus) estimated.
- One pole, 55-ft. ft., red cedar with 8-in. top; creosote-tank treated; set in loam; infested with termites; eight years estimated additional life.
- One pole, 50-ft., red cedar with 8-in. top; creosote-tank treated; set in adobe; infested with termites; five years estimated additional life.
- Three poles, 50-ft., red cedar with 7-in., 8-in. and 9-in. top; creosote-tank treated; set in silt; infested with termites; five years estimated additional life.
- One pole, 50-ft., red cedar with 7-in. top; not treated; set in loam; infested with termites; four years estimated additional life.
- One pole, 50-ft., Douglas fir with 8-in. top, creosote-brush treated; set in sandy clay; infested with termites and rotting; must be replaced at once.

Southern Sierras Power Company Report

Table II covers a number of 33-kv. distribution pole lines on which a fairly complete record of pole stubbing and replacement has been kept. Part of the lines in this list, as may be noted, were erected during the years 1912 and 1913. These poles practically all were given a superficial brush treatment, using special creosote preservative. Most of these were treated in our yards or in the field. Some of the poles were received from the supplier already treated and records do not show whether preservative was applied by brush or by dipping. At any rate records show that we did not buy any poles prior to February, 1914, that were treated by the open-tank method. After the above date, however, all of our pole purchases have specified the open tank "B" treatment and all poles have been western red cedar, partly from Oregon and partly from Idaho, except two carloads of Douglas fir poles purchased in 1924, that had been treated by the reuping process. None of these, however, is included in the tabulation.

In general it might be said that our belief is that cold special or other creosote preservatives superficially applied by brush or cold dipping are of little or no value as a pole preservative and probably not worth the initial expense. We do not believe that sufficient time has elapsed to draw definite conclusions relative to the open-tank treatment, but our belief is and the tabulation will indicate that this treatment does have a decidedly beneficial effect and probably is worth the additional cost.

With respect to the full-length treated Douglas fir poles it is, of course, too early to draw any conclusions relative to the protective value of the treatment. Our observation so far has been that the treatment practically eliminated checking and splitting of the poles and we believe also the twisting of poles that has been observed in untreated poles of several varieties of fir and pine. If the treatment permanently prevents checking and splitting there is every reason to believe that it will be an effective preventative of termite damage although this remains to be proved by several years of use.

Experience of The Southern Sierras Power Company with full-length treatment, in common with that of other companies who purchased poles at about the same time was unfortunate with respect to the large amount of free creosote which was left on the surface of the pole. This made them very objectionable to the men handling them and until this difficulty can be overcome The Southern Sierras Power Company is not disposed to purchase more poles treated in this manner.

Referring again to the tabulation the column showing the number of poles stubbed in 1920 is based upon a general inventory of distribution lines made at that time. It has been our practice during the past two or three years to examine poles on our 33-kv. lines annually and to stub those which showed signs of weakness. The determination of the method or the necessity for stubbing is made partly by excavating around the base of the pole to examine the condition of the surface and also by testing the strength of the pole by means of pike poles on either side.

Los Angeles Bureau of Power and Light Report

The North Garvanza 33-kv. line was one of the first lines installed by the Bureau of Power and Light during the early part of 1916. These poles all were treated with creosote by the open-tank method. An inspection made during December, 1925, of about a mile of line failed to show any sign of decay. These poles all were in good shape, having no checks or cracks near the ground line. The dirt was taken away from the butt about a foot below the surface, the poles sounding solid and no decay showing.

A recent inspection made of a mile of poles installed in 1917 in the vicinity of Figueroa and Florence showed the same condition except that four of the poles had checks in them which extended below the ground line. In the vicinity of these checks the poles showed evidence of decay.

The Bureau of Power & Light never has installed anything but butt-treated poles. However, as the first poles were installed during 1916, we are unable to give data which would tend to show the life of poles beyond that time.

Southern California Edison Company Report

A definite inspection was made of four particular lines, first a section of the old Newmark-Pasadena 15-kv. line. In the particular section inspected there are 24 50-ft. red cedar poles. These poles were set untreated and unpainted in 1912. The soil in this location is a gravelly clay, well drained. These poles all were exceptionally large at the butt and though the sapwood is decayed and the heartwood showed signs of decay in a number of locations, this line would probably serve several more years due to the fact that the poles were so large that sufficient live wood was left intact. Nearly all of these poles show signs of termites.

Second, a portion of the old Huntington Beach line. This line was built in 1914 of untreated red cedar poles. This particular section inspected consisted of 55 40-ft. poles set in sandy loam, part of the territory being alkali. All of the poles show bad signs of decay and about 40 per cent of them need to be replaced or stubbed at the present time. Also all of the poles are badly infested with termites.

Third, a 10-kv. line out of Long Beach on Cherry Street. These poles are red cedar, untreated and unpainted, set in 1908. This particular group inspected consisted of 85 40-ft. poles. The soil is black adobe. This whole line is in very poor condition, all the poles being badly decayed. Sixty per cent of them are stubbed and some of the poles have two stubs, the first one having decayed. This line is being replaced at the present time by new poles.

Fourth, a section of distribution line on Center Street, just east of the town of Cypress. This particular section of line consisted of 25 red cedar 45-ft. poles butt-treated by the open-tank method. These poles were set in 1916 in sandy loam soil. All of the butts are in very good condition showing no signs of decay. Every pole is infested badly with termites down to the creosote line on the pole, which is approximately 2 ft. above the ground. These poles are in such condition that they probably will have to be replaced within four or five years due to the bad condition of the part above ground. This same condition, of treated poles with the butt in perfect condition and the unprotected top badly eaten by ants, is a common occurrence in many different sections.

An experiment which has been carried out is the cutting off of the decayed portion of an old pole and resetting the pole untreated, as a shorter one for service in certain locations. Examination showed that these poles at the end of approximately 3 years were in as bad a condition as new poles which had been in service 10 or 12 years. In Ventura County we took down many miles of pole lines that had been set for approximately 14 years. The butts were in very bad condition, over half of the poles being stubbed. These were 45 and 50-ft. poles and were cut back and treated with cold creosote in open

tanks, giving a 48-hr. immersion. These poles then were reset for a low-voltage distribution and have been in service for approximately five years. Recent inspection showed that the butts are in very satisfactory condition, but the tops of the poles being approximately 20 years old are causing considerable trouble due to splitting. This development probably will cause early replacement.

Los Angeles Gas & Electric Corporation
Report

TABLE IV.—Western Red Cedar poles. Tops of all poles painted, butts treated as shown. All poles located in Los Angeles.—
Los Angeles Gas & Electric Corporation

Overall Length of pole (ft.)	App. Dia. of top (in.)	Date Set	Soil Conditions	Condition of pole Jan. 1926	Estimated additional Life	Treatment
60	8	1914	Dry Sandy	2 in. dry rot	2 yrs.	None
60	8	1914	Dry Sandy	2 in. dry rot	2 yrs.	None
60	8	1914	Dry Sandy	2 in. dry rot	2 yrs.	None
60	8	1914	Dry Sandy	1 in. dry rot	3 yrs.	None
60	8	1914	Dry Sandy	1 in. dry rot	3 yrs.	None
60	7	1914	Dry Sandy	3 in. dry rot	1 yr.	None
60	7	1914	Dry Sandy	3 in. dry rot	1 yr.	None
60	6	1914	Dry	Good	6 yrs.	None
60	6	1914	Dry	1 in. dry rot (2 in. dry rot) (ants at work)	3 yrs.	None
60	8	1914	Dry	3 in. dry rot	1 yr.	None
60	8	1914	Dry	Rotted off	None	None
60	8	1914	Dry	2 in. dry rot	2 yrs.	None
65	8	1914	Dry	Good	6 yrs.	Charred butt
65	8	1914	Dry	Good	6 yrs.	Charred butt
65	8	1914	Dry	Good	6 yrs.	Charred butt
65	8	1914	Dry	Good	6 yrs.	Charred butt
65	8	1914	Dry	Good	6 yrs.	Brush-treated butt
65	8	1914	Dry	Good	6 yrs.	Brush-treated butt
65	8	1914	Dry	Good	6 yrs.	Charred butt
65	8	1914	Dry	Good	6 yrs.	Charred butt
65	8	1914	Dry	Good	6 yrs.	Charred butt
65	8	1914	Dry	3 in. dry rot	1 yr.	None
65	8	1914	Dry	2 in. dry rot	2 yrs.	None
65	8	1914	Dry	1 in. dry rot	3 yrs.	None
65	8	1914	Dry	3 in. dry rot	1 yr.	None
65	8	1914	Wet Sandy	3 in. dry rot	1 yr.	None
65	8	1914	Dry Sandy	Worms and ants, rotted off	None	None
65	10	1914	Wet Sandy	1 in. dry rot	3 yrs.	None
65	8	1917	Dry adobe	Good	10 yrs.	Open-tank
65	6	1917	Decomposed granite, dry	3 in. dry rot	2 yrs.	Creosote
65	6	1917	Dry yellow clay	Good	10 yrs.	Creosote
65	6	1917	Dry yellow clay	Good	10 yrs.	Creosote
65	7	1917	Wet adobe	Good	10 yrs.	Creosote
65	6	1917	Dry yellow clay	Good	10 yrs.	Creosote
65	6	1917	Dry sandy	Good	10 yrs.	Creosote
65	6	1917	Wet adobe	Good	10 yrs.	Creosote
65	8	1917	Dry yellow clay	Good	10 yrs.	Creosote
65	8	1917	Dry adobe	Good	10 yrs.	Creosote
65	6	1917	Dry yellow clay	Good	10 yrs.	Creosote
65	8	1917	Dry yellow clay	Good	10 yrs.	Creosote
65	7	1917	Dry yellow clay	Good	10 yrs.	Creosote
65	8	1917	Wet adobe clay	Good	10 yrs.	Creosote
65	6	1917	Decomposed granite, wet	Good	10 yrs.	Creosote
65	6	1917	Decomposed granite, dry	Good	10 yrs.	Creosote
65	6	1917	Dry yellow clay	Good	10 yrs.	Creosote
65	7	1917	Dry yellow clay	Good	10 yrs.	Creosote
65	8	1917	Dry clay adobe	Good	10 yrs.	Creosote
70	6	1917	Wet yellow clay	Good	10 yrs.	Creosote
75	6	1917	Wet adobe	Good	10 yrs.	Creosote
75	8	1917	Wet adobe	Good	10 yrs.	Creosote
70	6	1917	Wet adobe	Good	10 yrs.	Creosote
65	8	1917	Wet yellow clay	Good	10 yrs.	Creosote
65	8	1917	Wet adobe	Good	10 yrs.	Creosote
65	6	1917	Dry adobe	Good	10 yrs.	Creosote
65	6	1917	Dry adobe	Good	10 yrs.	Creosote
65	6	1917	Dry adobe	Good	10 yrs.	Creosote
70	6	1917	Dry adobe	Good	10 yrs.	Creosote
70	6	1917	Dry adobe	Good	10 yrs.	Creosote
75	6	1917	Dry adobe	Good	10 yrs.	Creosote
75	6	1917	Dry adobe	Good	10 yrs.	Creosote
75	8	1917	Dry adobe	Good	10 yrs.	Creosote
80	6	1917	Dry adobe	Good	10 yrs.	Creosote
90	6	1917	Dry adobe	Good	10 yrs.	Creosote

San Joaquin Light & Power Corporation
Report

During 1911 and 1912 we built more than 200 miles of transmission line using butt-creosoted red cedar poles 50 ft. in length. To date these poles are in good condition and it never has been necessary to replace any of them because of deterioration either above or below the ground. These poles are set in all kinds of soil including black and white alkali.

It is believed that they will last 15 or 20 years longer.

During the war when creosote was hard to obtain we set approximately 22,000 Port Orford poles untreated. A great number of these poles had to be stubbed within three or four years, and the stubbing has gone on continually up to the present time. We have stubbed at least 50 or 60 per cent of these poles to date and it is only a matter of three or four years more until the entire 22,000 will be stubbed. The biggest part of the deterioration in the Port Orford poles, in some districts, has been caused by ants. However, if the Port Orford poles were creosoted they would in all probability last 20 years. At the present time a line built of Port Orford creosoted poles in the Spring of 1917 is being replaced and the poles show practically no sign of deterioration. In fact they are in such good shape that we intend using them on a distribution line without retreating.

Pacific Gas and Electric Company Report
(West-Side Division)

The following report covers poles on the Pacific Gas and Electric Company's lines in the Sacramento Valley, north of Sacramento to the north limits of the system in Shasta County. As it was not practical to inspect all the poles in any certain line, from 10 to 20 poles in various localities in a line were inspected carefully and their condition was taken as representing the average for the whole line for the untreated poles. Inspections also were made on lines of butt-treated poles, but on account of the fact that the first treated poles were set in this locality in 1921 very little valuable information is obtainable at the present time. Some data also are given on the termite and the full-length treated fir poles.

Untreated Poles

Data as tabulated (tables not published) on the various lines indicate that the average life of untreated poles in this northern section of California is about 20 years. Several lines or sections of lines still are giving service after 25 years. Other points brought out by this study and determined by actual recent inspection of different size poles in various types of soils are as follows:

1. Eastern-slope red cedar lasts longer than western-slope red cedar poles. In most cases, in any line where there are both kinds of poles, the western-slope pole will need stubbing before the eastern slope pole.
2. Poles with large butts of course last longest.
3. Poles set in lava last the greatest number of years while those set in adobe rot the quickest.
4. Small poles, 25 and 30 ft. long and of small diameter at top and bottom, rot out after a few years and tops crack and check.
5. Woodpeckers attack poles only where the poles are near oak trees. The woodpeckers peck holes in poles in which to store acorns and not for anything they find in the poles.
6. Poles set in black adobe soil were found to be completely rotted off 2 ft. up from the bottom. These were new untreated poles set in 1921.
7. A number of poles in one line 24 years old were found to be only a shell under ground. Upon inspection of several poles, 2 in. of solid wood was found on the circumference of the butts of the poles, with the center rotted out from the bottom to a point 6 in. above the ground. This condition existed both in adobe and in gravel soil.
8. Redwood poles seem to give very good service, but will cost considerably more than cedar in the longer poles being used today.

Treated Poles

The first open-tank, creosote-penetrated, butt-treated poles were set in this locality in 1921. Inspections were made recently of a number of butt-treated poles set at that time and the butts were found to be in excellent condition, almost as good as the day the poles were set except for two poles upon which the termites had started to work. These poles will be covered in a later paragraph.

As treated poles have been in use only a few years there is no more that can be said about them at this time. Most all treated poles set are northern red cedar, 35 ft. and over in length and with top diameters from 8 in. and up.

Termites

The only termites found in this locality were found in poles in a distribution line south of Red Bluff, (not included in preceding list). This line was built in 1921 and both butt-treated and untreated poles were set. Termites were found in some of the untreated poles just below the ground line but they have not penetrated below the sap. Termites were found in two butt-treated poles just below the ground line. These are 8-in. top, 35-ft. poles with a butt diameter of approximately 14 in. The penetration of the creosote on these two poles is not very deep and the termites are working beneath the creosote. On one of the poles they are leaving a creosoted shell around the poles and have eaten the poles away under this shell for about $\frac{1}{4}$ in. The butts of these two poles appear to be in sound condition where the termite is not working. Poles attacked by termites, both untreated and treated, are set in black adobe soil.

Full-Length Treated Poles

Recently 56 full-length treated 50-ft. Douglas fir poles were set in a 60-kv. line north of Corning in the West-Side division. These poles were in the pole yard a year and a half before they were used. They were roofed, gained and bored for steps before treatment. When they were set it was found that some of the gains had to be squared up on account of the poles having twisted in seasoning after treatment. In cutting into the gains, it was not necessary to penetrate below the creosote. The lineman did not experience any trouble from creosote burns while working on these poles as the poles were set in December.

Pacific Gas and Electric Company Report Sacramento Division

Sacramento County

A total of 23 poles were examined, 18 more or less infested with termites. Four of 18 showed termites in tops of poles. One pole showed evidence but no live termites. Most of the poles were cedar and set from 2 to 30 years. Redwood poles also were found to be infested; some redwood stubs set in 1924 were filled with termites.

Both species of termite were found, the small ones working principally in the sap wood below or just above the ground and the large termite at or below the ground line and in both the sap and heart wood. Butt-treated poles set five years ago showed no signs of termites.

Yolo County

Of 16 poles examined eight showed termites and one of the eight was infested in the sap wood at the top of the pole.

Solano County

The several locations inspected showed no indications of termite.

Mr. Maynard, superintendent of the San Jose division, reports that of 27 poles examined 25 were infested, one for its entire length and one for about 30 ft. The remainder were affected principally at the ground line and for approximately 2 ft. below and above ground.

The line reported upon extends from near San Jose to Salinas and consists of 60-ft. cedar and fir poles set in 1912. The soil generally is sandy loam.

Cedar stubs set in 1922 also were found to be infested.

From information gained so far, it appears that:

1. Termite is on the increase.
2. Soil conditions have but little to do with infestation.
3. Most any kind of wood is subject to their attack, although the softer woods are preferred.

Causes of Pole Deterioration

It may be noted from the remarks in the foregoing that the more usual causes of pole deterioration are natural rot and termites (white ants). Of these two, the termites seem to be the more serious. Poles and crossarms which otherwise would be sound are found to be entirely riddled by these pests. See Fig. 1.

A general description of the termites is given in the 1922 and 1923 reports of the N.E.L.A. overhead sys-

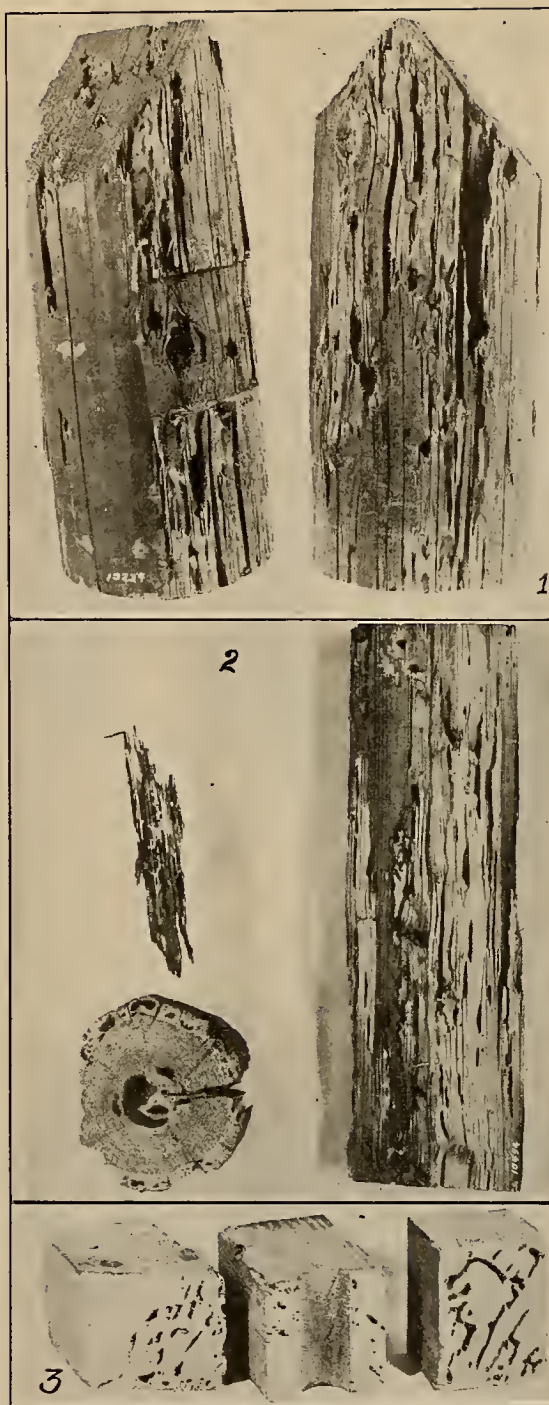


Fig. 1. Samples of termite ravages. 1—exterior of cedar pole. 2—sections through cedar pole. 3—fir crossarms.

tems committee. Briefly reviewing what is given there it should be stated that there are two species which attack poles.

The species *Reticulitermes Hesperus* Banks lives in the ground and enters the poles through subterranean passage and requires a certain amount of moisture in order to live. For this reason, even though it may work up the pole for a distance of several feet, it always will keep its runways open so as to return to the ground for moisture. In some respects the work of this species is more dangerous than others because of the fact that it is more vital to retain the strength of the pole near the ground line than at other points higher up. It is reasonable to expect that a good butt-treatment of hot creosote will protect the butts of poles against this species of termite for a number of years, until the creosote is leached out or checks open up in the pole, permitting termites to enter the pole without having to eat their way through the creosoted areas.

The other species of termite which is prevalent in southern California is the *Kaloterms minor* Hagen. See Fig. 2. This species enters the poles from the air at times of swarming, either at the top or through lateral cracks or checks. It is able to live its life without having to go to the ground for moisture, maintaining itself almost indefinitely in the driest wood. The protection of poles against this species of termite is a serious question, as it cannot be kept out of the pole by merely creosoting the butt.

The winged adults swarm at certain seasons of the year, the males and females pairing off and lighting on the poles where they immediately snap off their wings, enter the cracks and from these retreats readily bore their entrance tunnels into the sap or heartwood as the case may be. There they soon establish new colonies. Once these insects have become well settled they will continue to multiply and to tunnel until they have honeycombed the entire pole.

Reports of the committee members show that the termites are more or less active in all parts of the state, probably being most active in the southern portion.

Other causes of pole destruction which are encountered occasionally are, woodpeckers and carpenter

cavations longitudinally. The size of the excavations varies from $\frac{3}{8}$ to $\frac{1}{2}$ in. in diameter and 6 in. in length. The carpenter bees seem to attack only rather soft wood and the damage which they have done has not been serious.

Conclusions and Recommendations

For the purpose of this report, it will be considered that the life of a pole has ended when it is necessary to spend money to continue it in service.

From the reports given above it appears that the life of untreated western red cedar poles in most locations has been from 10 to 15 years and for butt-treated poles from 15 to 20 years. No doubt in districts where the termite attack is more severe, if the rule was followed of replacing the pole when its safety factor has been reduced to two-thirds of the minimum required for its respective grade of construction, it would be found that the lower figure in each case is about the average life. The conclusion, therefore, is quite obvious. In locations infested with termites a full-length treated pole should be used.

Western red cedar is becoming more scarce each year and gradually increasing in price. There are two species of wood, however, which can be had in abundance in pole sizes, the southern pine and Douglas fir. Both of these timbers, on account of their thick sap-wood, take creosote pressure-treatment well. Fig. 5 shows representative increment borings taken from these two kinds of poles which had been given the 8-lb. empty-cell pressure treatment. In general the

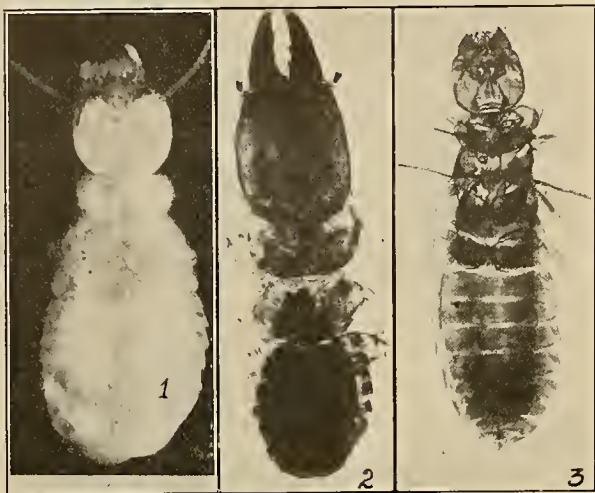


Fig. 2. Microscopic reproductions of the termite, magnified about 14 diameters. 1—worker termite, Kaloterms. 2—soldier termite, Kiloterms. 3—sexed termite, Kaloterms, at time of swarming.

bees. The woodpeckers seem to be especially active where pole lines pass through districts where there are oak trees. Fig. 3 shows the manner in which these birds will stud the exterior of the pole with acorns and excavate the interior for their nests and further storage of acorns.

The attack of the carpenter bee (*Xylocopa*) is shown by Fig. 4. The carpenter bee resembles in appearance



Fig. 3. Examples of woodpecker damage

the bumble bee, being about the same size, but without yellow markings. In the mature state it is black.

These bees eat horizontally into the pole until they get well under the surface and then extend their ex-

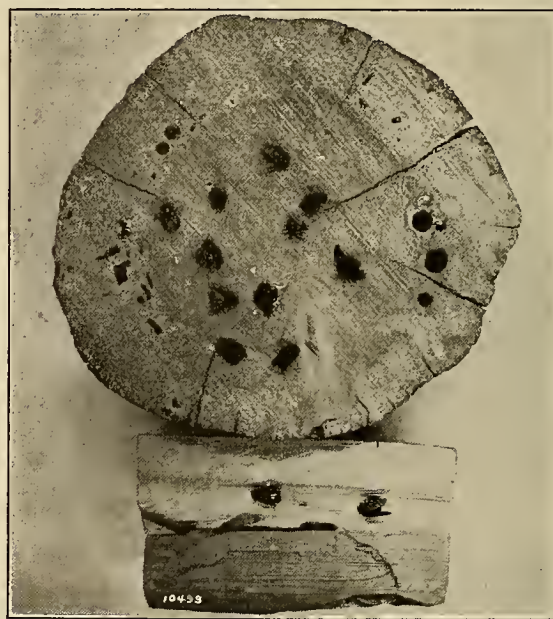


Fig. 4. Cross-section of cedar pole attacked by both termites and carpenter bees. Bees excavated from their (round) holes may be noted lying on the surface of the wood.

southern pine has a thicker sap-wood than Douglas fir and takes a deeper penetration. The increment borer for making these tests is shown in Fig. 5. The holes so made always should be closed with creosoted plugs.

The report of the Forest Products Laboratory gives the strength of southern pine as from 7,500 to 8,700 lb. per sq.in., and Douglas fir 7,800 lb. as compared to western red cedar 5,200 lb. Their weight is somewhat greater than cedar, but due to the greater strength the usual practice is to use poles of 1-in. less diameter than of cedar.

Full-length pressure-treated southern pine has a life record of some 28 years to date in the southern states and these same poles are reported to be good for many more years. Douglas fir has not been used heretofore for poles to any great extent, but it has made a good record in other structural uses when pressure treated. The report of the San Diego company indicates that the butt-treated fir is to be preferred to butt-treated cedar.

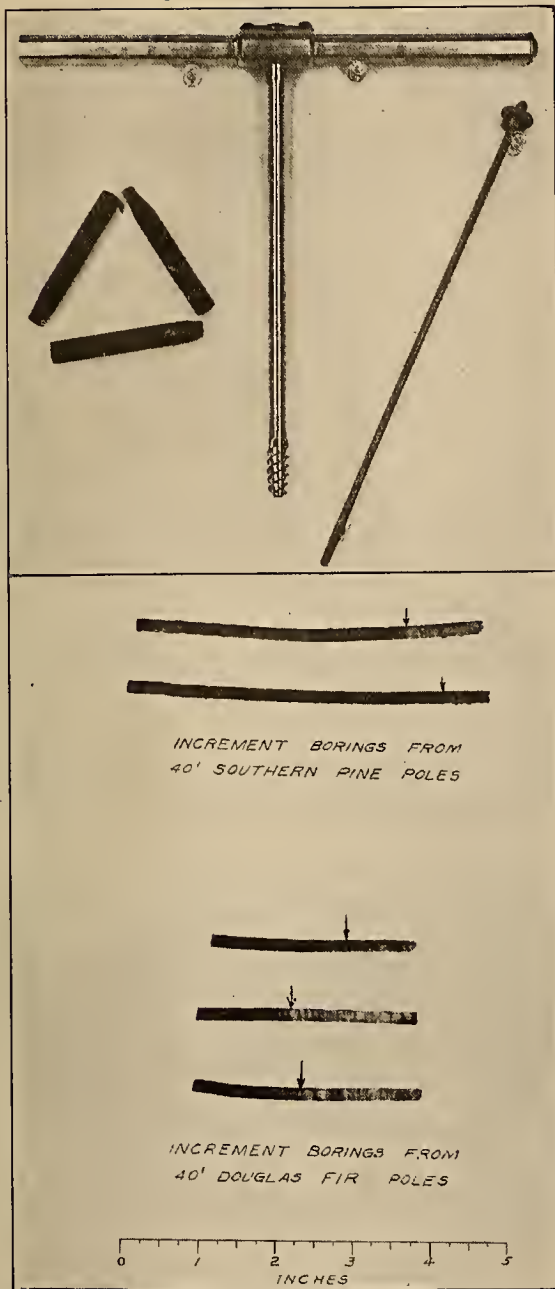


Fig. 5. Increment borings (below) and the increment borer (above). Samples of creosoted plugs for closing test holes may be noted (above).

The Southern Pacific Company has installed a number of full-length treated Douglas fir poles. At the present time it has installed full-length creosoted Douglas fir poles in its overhead tramway at Oakland Sixteenth Street station. These poles were treated in 1909 by the full-cell process and they apparently are in sound condition after 15 years of service, nor do they show any checks or twisting.

It also is reported that creosoted fir piling removed from the Southern Pacific Company's Santa Monica wharf after 27 years of service and from the Oakland dock "A" after 29 years of service still were in such good condition that they were reused at other locations.

It seems that the termites are particularly attracted by cedar. Possibly because it is a soft wood or maybe because of its flavor. Another theory is that due to the frequent checking in a cedar pole the termite has ready access. At times of swarming they are seeking shelter from the birds which pursue them. Whatever the reason it is quite usual to find a cedar pole completely riddled by termites and the fir crossarm untouched. Or if the arm is attacked the entrance is made from the pole at the gain.

The first cost of full-length, 8-lb. pressure-treated Douglas fir shipped from Oregon or Washington by boat is about the same as cedar butt-treated and painted. Southern pine, due to the freight charge, is somewhat higher than cedar.

When making a comparison of different kinds of poles and treatments the annual charges should be considered rather than the first costs. In determining these annual charges an assumption first must be made of the expected life of each kind of pole and thus the annual depreciation obtained. To this should be added the interest charge. Plotting the sum of these charges for the various kinds of poles against length delivered at a given location will be a valuable aid in making a choice of poles to use.

Our recommendation is that not only full-length treated poles be used but also the crossarms, wooden pins, and any other wooden attachments on poles be treated with creosote.

References

Mechanical Properties of Woods Grown in the United States, U.S. Department of Agriculture, Bulletin No. 556.

A Revision of the Nearctic Termite by Nathan Banks with Notes on Biology and Geographic Distribution by Thos. E. Snyder, Smithsonian Institution Bulletin No. 108.

N.E.L.A. overhead systems committee reports 1922 and 1923.

Transformer Standardization*

Four subdivisions of this subject were considered by the subcommittee, as previously recommended. At least two of the subdivisions undoubtedly are of considerable value at this time and should receive the careful attention of the member companies.

Electrical Characteristics to Permit Banking for Parallel and Polyphase Operation

By H. S. LANE

It is not the aim of this report to make a technical exposition of the subject, but rather to discuss briefly its practical aspect by reference to cases experienced in practice.

Obviously the division of load between two transformers banked in parallel and supplying a common load will depend upon the related factors of impedance and regulation. The regulation of a transformer depends not only upon its total internal impedance but upon the ratio of its reactance and resistance. Thus at a given load current the apparent drop in the transformer will vary with the power factor of the load, being a maximum when that is equal to the "power factor" of the transformer impedance. Therefore the statement that two transformers in parallel will divide a load inversely as their impedances is correct only if the impedances are considered vectorially.

The relation of resistance, reactance and total impedance in the design of the several lines of power and distribution transformers is governed by the emphasis placed upon all-day vs. full-load efficiency and by the desire, particularly in power transformers, to limit short-circuit currents. The present tendency is toward higher impedance-ratios. Power transformers formerly 3 to 4 per cent now run usually 6 to 8 per cent. Distribution transformers formerly 1 to 3 per cent, now 2½ to 5 per cent. In a representative line of distribution transformers the impedance ratio increases slightly with the kva. rating. In the smaller sizes the ratio of resistance to reactance increases, resulting in better regulation at low power-factors.

If the parallel transformers are not at the same location then obviously the impedances of the circuits, particularly the secondaries connecting them, are involved in the problem as well as the distribution of the load with respect thereto. Two extremes in this respect met in practice are illustrated in the two cases following.

* Report of Joint Subcommittee of apparatus committee and overhead systems committee. H. H. Minor, chairman. K. B. Ayres, A. W. Copley, J. H. Cunningham, H. S. Lane, H. L. Sampson.

In one case a 100-kva. single-phase subway transformer was installed in manhole A, supplying 3-wire secondary cable extending to manhole B at the next corner. The aggregate service load at A was about 100 kva., at B about 25 kva. A 25-kva. transformer was installed at B to relieve transformer A. Transformer B got excessively hot and a test showed that it was carrying about 75 kva., while the larger one at A was carrying only about 50 kva. Investigation showed that the impedance of the older-type 25-kva. transformer was less than that of the 100-kva. transformer, while the drop in the secondary was negligible; hence the effect noted. This and other similar cases were corrected by connecting small reactances of the proper value in the secondaries, mounted inside the transformer case.

The opposite condition is presented by the connection of transformers in parallel to overhead secondaries where the line impedance may be large relative to the transformer impedances. In one such case of two similar transformers the load was so unequally distributed along the line that one transformer was seriously overloaded. This as well as other similar cases was corrected by judiciously adjusting the number, size, and spacing of the transformers as well as secondary wire-size, to obtain proper distribution of loads and line-drops.

This difficulty does not frequently enter in respect to power transformers since such transformers selected for parallel operation are nearly always exactly similar. No instances of such cases of difficulty are at hand.

All of the above, of course, is based upon the presumption that the transformers involved in the parallel are of equal voltage ratio.

The division of load, in particular unbalanced load, between the transformers of a 3-phase bank with delta secondaries presents two distinct cases, depending upon whether the primaries are connected star, ungrounded, or delta.

In the case of ungrounded star primary connections, while the impedance drop in the transformers affects the result in a slight degree, practically the criterion which determines the division of current is the condition that the sum of currents at the primary neutral equals zero.

With primary connected delta the condition for solution is that the sum of the impedance drops in the transformers shall equal zero. In this case the single-phase load divides in the two paths in inverse ratio of their impedances. With single and 3-phase loads of the same power factor and similar transformers of equal impedance ratios, transformers selected for the three phases in accordance with their respective kva. connected load properly will divide the combined load.

Both of these cases can be proved easily by vector diagrams, using the proper phase relations and considering the power factor of each load. The study will be found very interesting and can be substantiated readily in actual installations.

It is believed that this discussion may be of value in the consideration of these conditions, which are met with every day in the field. It is probable that not enough thought has been given the subject, in many cases resulting in damaged or destroyed transformers due to the unequal division of load in 3-phase banks.

Improvement in Fuse Protective Devices

By M. O. BOLSER

Before any constructive work could be accomplished it was necessary to find out the type of fuse used by the different companies of the P.C.E.A. We therefore sent out a questionnaire to the different companies.

Without exception porcelain-plug cutouts are used for the smaller sizes of transformers on 2.3 kv. Several different makes of expulsion-type primary cutouts are used for capacities of 25 to 100 amp. Oil-type cutouts or oil switches usually are used above 100 amp.

Comments from the different utilities seem to indicate that the porcelain-plug cutouts, even for the smaller-sized transformers, were liable to be destroyed under short circuits. They are used only because

they are cheap. Any substitute in the smaller capacities would cost from 5 to 10 times the cost of the plug cutouts.

One company uses expulsion-type cutouts on all of the smaller sizes of transformers due to the fact that the line voltage is 4.6 kv. and porcelain-plug cutouts would not stand the voltage. Each company seems satisfied with the particular make of expulsion-type cutouts that they are using.

Tests on Cutouts

Tests on different types of cutouts have been made by several companies, but under different conditions and it is hard to draw any conclusions.

The Los Angeles Gas & Electric Corporation took three standard 100-amp. fuse boxes and connected them in series with a phantom load. In each test, after several hours the C fuse melted while A and B remained O.K. The holder was charred each time due to excessive heat which in each case was about 160 deg. F.

The Pacific Gas and Electric Company made tests on a number of cutouts by subjecting them to short-circuit on the secondary side of a 11/2.4-kv. transformer. These tests and conclusions are to be found in Appendix 2 in the N.E.L.A. overhead systems committee's report of 1923.

The Bureau of Power and Light, Los Angeles, made a number of tests by connecting cutouts to a 3,600-kva. generator through 150 ft. of No. 4 weatherproof wire. All of the cutouts opened the circuit successfully, but some of the fuse containers were damaged.

There is quite a report on fuse-box tests made by an operating company in the east outlined in the report of the electrical apparatus committee for 1925. This gives the manufacturer's name and catalog number for each cutout.

Standardizing Fuses for All Makes of Cutouts

At the present time most of the companies are using plain fuse wire in plug-type cutouts. The criticism of this is that, due to pinching of the fuse under the screw or oxidizing of the fuse metal at the screw, the fuse blows under normal load. The manufacturers make a fuse with terminal lugs, which is interchangeable with the different makes of plug cutouts. Due to the cost it is not used very extensively by operating companies.

It does not seem possible to standardize fuse links for the different kinds of expulsion-type cutouts. The different manufacturers claim advantages in their particular style or type of expulsion cutout and fuse and as the fuse links differ, they could not be standardized without a decided change in the cutouts themselves.

Standardizing Fuse Ratings

The question of fuse rating by the manufacturers has not been given much consideration due to the small amount of information available. The Board of Fire Underwriters states: "Link fuses shall be stamped with 80 per cent of the maximum current which they can carry indefinitely, thus allowing about 25 per cent overload before the fuse melts."

One manufacturer gives the following information regarding his fuse:

The melting point of our fuse links is around 419 deg. C., maximum. The charring point of the fiber is around 185 deg. C. The boiling point of our fuse metal is about twice the melting point. This is of importance as this is the temperature of the arc. In order to have fuses blow at a reasonable amount of current above their rating it is necessary for the link to become quite hot when the cutout is carrying 100 per cent of the rating of the fuse link. This condition should not be allowed to exist. Cutouts should not normally carry more than about 65 per cent of the rating of the fuse link. There are, in the blowing of a fuse link, two distinct cycles. One is called the heating cycle wherein fuse link heats up to melting point. Then comes the arcing cycle where the principle of the cutout comes into play in interrupting the circuit. Our fuse links normally are designed to melt at a current not exceeding 15 per cent of the rating of the link in a period of time not exceeding 5 min. Our fuse links also are designed to carry 100 per cent current continuously, but when carrying 110 or even 100 per cent the heat of the link has gone up to from 250 to 350 deg. which, you will note, is more than enough to char the holder. This prevents the use of an expulsion-type fuse for overload protection.

It is noteworthy that this manufacturer suggests that a 100-amp. fuse should normally carry not more than 65 amp., which is about full-load current for the

transformer as used by most of the operating companies. It would seem advisable that all of the manufacturers should adopt a rating similar to this; that is, a 100-amp. fuse normally should carry not more than 65 amp., and that the fuse should melt in less than 5 min. at a current not exceeding 150 amp. This is a much wider variation than the Board of Fire Underwriters requires for link fuses, but, owing to the length of the fuse and the amount of heat to be dissipated, it is inadvisable to rate them as close as the fire underwriters rate link fuses.

Terminals and Lead Wires or Connections

By T. W. SNELL

It has been believed for some time that there are various details of the design of transformers to which consideration might be given with a view to bringing about improvements in design which might better fit in with modern tendencies in overhead construction. As a matter of fact there have been very few changes in recent years in certain of the physical details of transformers. This may have been due to a feeling that these details were fixed and construction therefore made to conform to them instead of there being any effort to design a transformer to fit in with contemplated changes in construction methods.

We are assured that if changes in transformer design are desired by the users the manufacturers will be only too glad to make those changes, provided the users will agree that they are necessary. This, of course, is a self-evident fact. As an example, the manufacturers recently have standardized to a large extent on transformer hangers and considerably reduced the number of hangers required for the range of transformer sizes used. This has facilitated joint-pole construction and has simplified handling.

In order that an expression of opinion might be received from member companies on other possible changes in transformer detail a questionnaire has been circulated asking for suggestions on various proposed changes. Responses have been fairly complete and indicate some considerable thought on the questions.

Five details were discussed as follows:

Shell—Most member companies agree that while present dimensions of shells are not objectionable, they strongly favor uniformity in height for a given size of the various manufacturers. This would greatly facilitate installation and simplify construction. One company recommends a maximum height of 4 ft. for sizes to and including 50 kva., this dimension including hangers. It also was agreed that consideration should be given by the manufacturers to the prevention of slopping of oil during transportation. At present this often is extremely objectionable.

Hangers—Previous attention has been given to cutting hangers so that they did not extend below the bottom of the transformer tank. As to the projection of the hanger above the top of the case there was fairly general agreement that this feature of design should remain unchanged. This is due largely to the somewhat different methods of construction employed in various parts of the state. Some few companies believed that raising the transformer even the few inches gained by the change would be justified.

Bushings—All users of transformers agreed that the present location and arrangement of transformer bushings is perfectly satisfactory and fulfills all requirements. Mention was made of the need for so placing bushings as to protect them against breakage and of the desirability of providing a ready means for replacing broken bushings when necessary.

Arrangement of Terminal Blocks—All companies are in favor of a uniform arrangement of leads on terminal boards, but not at the expense of voltage taps, and strongly recommend a stamped connection diagram either on the nameplate or inside the cover. One company favors proving all connections with a voltmeter instead of putting entire dependence on the diagram. This also would locate open connections in the leads.

Leads—Opinion on the use of lugs on secondary leads was equally divided, but those who were in favor of them were especially emphatic in their preference. Therefore it appears desirable to retain lugs provid-

ing they are properly and adequately attached to the leads. Most companies believed that leads are preferable to some types of terminal blocks inside or outside of the shell, while other companies thought that some type of terminal blocks would be preferable. All companies favored secondary leads of a length not greater than the transformer case.

A careful consideration of the answers indicates that the consensus of opinion favors making no changes in transformers at the present time except in a few minor details.

Standard Voltage Ratios

By H. H. MINOR

The advisable ratio for transformers is dependent upon the practices of the users of the equipment with respect to distribution voltages and combinations of such voltages. The rating of utilization equipment also has a bearing on such ratios. The following is presented with the idea of evoking discussion of the different ideas presented.

Probably most companies standardize on 115-230 volts as being desirable at the consumer's service. This voltage also is fixed by standard equipment now in use. Therefore it seems logical to base transformer ratios upon that value.

A standard line of transformers for distribution lines long in use by practically all companies is the 2,300/115-230-volt class. It is at present a standard transformer as listed in Rule 9,015 of Electric Power Club standards. This standard transformer does not include primary taps, though transformers with taps can be purchased. Many companies have used and are still using these transformers on 2.3-kv., 3-wire systems.

As load has increased many companies have gone to so-called 4-kv. systems, using the 2.3-kv. transformers connected Y on the primary. This necessitated one of two plans for serving single-phase loads. Either the neutral wire had to be run and the system changed to 4-wire and the 2.3-kv. transformers used connected from line to neutral, or a transformer or voltage rating equivalent to the Y-voltage of the 2.3-kv. transformers used. There is no such transformer included in the Electric Power Club Standards. The primary voltage of such a transformer to deliver the same secondary voltage as the present 2.3-kv. class would be $2.3 \times 1.732 = 3.980$ kv. The larger use of the 4-kv. systems would make it seem advisable to include such a transformer in future standards.

Some use has been made of a 2.3-4.6 kv./115-230-volt transformer, using a 2-coil primary connected in parallel for 2.3-kv. use and in series for use on 4.6-kv. lines. These transformers now are standard. The adoption of this system does not adequately take care of conditions on growing systems when large numbers of 2.3-kv. transformers are in service and load increase has made a higher distribution voltage advisable.

The next higher distribution voltage commonly used is 6.9 kv. A line of transformers for this is included in the Electric Power Club standards, its rating being 6.9-11.95 kv. Y-6.585-6.275-6.960/115-230 volts. These primary taps do not agree with the adopted standard of the Electric Power Club of 5 and 10 per cent voltage variation, but were retained so as to agree with former practice. The logical step for those using these transformers was, as the load density increased, to use them connected Y on 4-wire systems in the same manner as the 2.3-kv. transformers were used on 4-kv. systems. The result was that either the 4-wire primary had to be used or a transformer obtained having a primary voltage approximately equivalent to $6.9 \times 1.732 = 11.95$ kv. The standard transformer available and the one that is used for this purpose is rated at 11.5-10.925/115-230 volts. It is seen that a discrepancy exists between the ratings of these two classes of transformers. For equal primary voltage the result will be about 4 per cent higher secondary voltage with the 11-kv. class transformers than with the 6.6-kv. class connected Y-delta, when both are operated on full winding.

The rated voltages of these two classes follow:

6,600-Volt Class		11,000-Volt Class	
Primary Volts	Secondary Volts	Primary Volts	Secondary Volts
6,900-11,950 Y	115-230, etc.		
6,585-11,405 Y	115-230, etc.	11,500	115-230, etc.
6,275-10,868 Y	115-230, etc.	10,925	115-230, etc.
5,960-10,322 Y	115-230, etc.	10,350	115-230, etc.

An obvious method of approximately equalizing these two classes of transformers would be to change the 6.6-kv. class by omitting enough turns of the primary winding to make the rating 6.585-11.405 kv. Y-6.275-5.960/115-230, etc. As used at present it is necessary to operate the 6.6-kv. class on that tap and the 11-kv. class on full winding to equalize secondary voltage. Another possibility would be to add enough primary turns to the 11-kv. class to make its rating 11.95-11.5-10.925-10.35/115-230, etc., and to leave the 6.6-kv. class as at present. It has been pointed out that this latter is the more logical because of the great number of 6.6-kv. class transformers in service compared to the 11-kv. class. On the other hand the former has been favored because of present equipment such as motors, converters, etc., being rated at 11 kv. It would seem that the comparatively small number of installations of this kind would rather minimize this objection.

While the above discussion relates to single-phase distribution transformers of 200 kva. and below, it is equally applicable to 3-phase transformers and to power transformers supplying service of 600 volts and below. A change in these classes of transformers also would necessitate a similar change in power transformers supplying distribution voltage.

Data regarding transformer ratios have been collected by a subcommittee of the electrical apparatus committee of the N.E.L.A. under the chairmanship of B. G. Jamieson. A special subcommittee was appointed by Mr. Jamieson to study these data and formulate a recommendation for revised standards to be presented to the apparatus committee. W. P. White of the General Electric Company was made chairman of this special committee and a report was tentatively adopted and distributed to the members of the national apparatus committee. This report is in the form of a table and refers principally to power transformers; sizes above 200 kva. In Mr. White's letter accompanying the table of proposed standards the statement is made that at present less than 50 per cent of the transformers sold in sizes above 200 kva. were standard. This table of proposed standards, in so far as it applies to transformers, is given in Table I.

TABLE I.—Proposed voltage ratings for systems and transformers as per report of N. E. L. A. apparatus committee, sub-committee on transformers and regulators.

Systems (kv.)	Step-up Transformers		Step-down Transformers	
	Pri. kv.	Sec. kv.	Pri. kv.	Sec. kv.
				115 volts 230 volts 460 volts 575 volts
2.4	2.3/3.98-Y	2.4/4.15-Y	2.3/3.98-Y	2.4/4.15-Y
4.15				
6.9	6.6	6.9	6.6	6.9
11.5	11.0	11.5	11.0	11.5
13.8	13.2	13.8	13.2	13.8
23.0	22.0	23.0	22.0	23.0
34.5	33.0	34.5	33.0	34.5
46.0	44.0	46.0	44.0	46.0
66.0	63.0	66.0	63.0	66.0
88.0	84.0	88.0	84.0	88.0
110.0	105.0	110.0	105.0	110.0
132.0	126.0	132.0	126.0	132.0
154.0	147.0	154.0	147.0	154.0
.0		220.0	210.0	

GENERAL NOTE. Guarantees of efficiency, heating, overload, etc. and over-voltage tests of all apparatus should be based on the rated voltage of the apparatus with the exception of step-down transformers, the over-voltage tests on which should be based on rated secondary voltage, and a primary voltage five percent greater than the rated voltage.

SPECIFIC NOTES. The voltage ratings of potential transformers should be the same as the recommended system voltage ratings, their secondaries should be rated approximately 115 volts to permit the employment of the now existing even ratios of transformation.

Transformers should be designed to operate during emergencies at 5 per cent above rated voltage, the overvoltage being obtained by over-excitation and not through the use of taps. They should be equipped with taps as follows:

(a) Step-up transformers should be equipped with the equivalent of two 2½-per cent full-capacity taps in the primary windings to provide additional range

for compensating for the voltage regulation of the transformers and to avoid over-excitation of generators.

(b) Step-down transformers should be equipped with the equivalent of four 2½-per cent full-capacity taps in the primary windings to provide additional range for compensating for line voltage drop.

(c) When possible 11.5-kv. systems should be discouraged in favor of 13.2-kv. systems.

Member companies are urged to study carefully this table of proposed standards. It will be found that there are many points not in conformity with Pacific Coast practice that should be made the subject of considerable discussion at future meetings of the Technical Section. There are a number of situations in connection with transformer standards on the Pacific Coast which are not in any way helped by these proposed standards.

The answers to the questionnaires sent out to member companies, P.E.C.A., on this subject have been far from complete and therefore do not express a consensus of opinion. A number of rather unexpected answers were received which indicates a very wide divergence in operating methods by various companies. Briefly, the answers which were received may be summarized as follows: Of the limited number that distribute at 4 kv. only three companies use 4-kv./115-230-volt transformers as furnished by the manufacturers. All others carry the neutral wire throughout and are not concerned with this problem. However, the majority considers it advisable to standardize on transformers having a ratio of 4 kv./115-230 volts.

Of those companies operating 11.5-kv. lines, but three companies use transformers connected star-delta for 3-phase. The number concerned with the problem of reconciling the star transformers now supplied, having a ratio of 6.9 kv./115-230 volts, with delta transformers, having a ratio of 11.5 kv./115-230 volts, therefore is very small. One of these recommends that the 11.5-kv. class should be changed to agree with the 6.9-kv. class. Others recommend that the 6.9-kv. transformers have the ratio changed to agree with the 11.5-kv. class.

No company answering the questionnaire is in favor of the abandonment of the 11.5-kv. system for the 13.2-kv. system as recommended by the N.E.L.A. subcommittee. This, of course, is natural because of the extensive use on the Pacific Coast of the former system.

Because of the few answers received to the questionnaire and the limited amount of discussion and other information available at this time this subcommittee is not as yet in a position to offer any definite recommendations on this subject to the association for presentation to the N.E.L.A. for action.

It is hoped that all member companies will give careful consideration to this report and be prepared to answer a final questionnaire, the answers to which will be submitted as an expression of general opinion of the transformer-using companies in this territory. Additional helpful information will be found on pages 96 and 99 of the 1925 proceedings of the association.

Use of Bare Wire for Distribution Lines*

In considering the use of bare wire on low-voltage distribution lines the committee has endeavored to bring out the arguments against the use of bare wire for such purposes as well as the arguments favoring its use. Investigation has been made among the member companies operating on the Pacific Coast and it has been found that some companies are using bare wire quite extensively on voltages from 220 volts up to and including 4 kv. The subject has been treated under the four following heads:

1. Safety to employees and the general public.
2. Service.
3. Cost.
4. Appearance and adaptability.

Investigation leads to the belief that the main value of weather-proofing on copper wire may be in supplying mechanical separation in cases of accidents.

* Report of Subcommittee, R. G. Boyles, chairman. E. R. Barber, S. M. Bullis, G. H. Hagar, E. Y. Porter, C. V. Walker.

The amount of confidence that should be placed in weatherproof wire preventing injury to pedestrians handling or coming in contact with fallen wires depends upon the life of the insulating compound in the insulation. While there is no doubt that some grades of wire installed for a period of one year or less will serve the intended purpose, it is believed that after the insulated wire has been in service for that comparatively short period the protection offered by the insulation is very doubtful. Many cases are on record where insulated wires have fallen to the street and the insulation protected the wire from arcing to the ground, thus leaving the line still energized. Pedestrians have come in contact with these wires and in some cases the insulation has protected them while in other cases it has broken down.

The public generally is much more careful to keep clear of a bare wire if they see one lying in the street than they are if the wire is insulated. There are many cases where pedestrians as well as linemen accidentally have come into contact with energized insulated wire and have escaped without injury. The question has been asked: "Would linemen be more careful working on bare circuits than they are when the wire is insulated?" Several fatal accidents occurred in 1925 which have been brought to the committee's attention. One member company had four fatal accidents to linemen working on distribution lines and in each case weatherproof wire had been used in the construction of the line. Some of the member companies of this committee do not think that employees are more careful when working on bare primary than they would be if the wire were insulated. Other members of the committee feel that the linemen will take greater precautions in handling bare wire.

Tests

In order to determine the amount of protection offered by triple-braid weatherproof insulation some tests were made on samples of wire which had been in service for periods of one, two and three years, respectively, in territory adjacent to the beach. In making these tests a standard 30-kv. insulation-testing set was used to step the voltage up from 110 volts to 30 kv. as found necessary. This set consisted of a 3-kva. transformer with a small hand-operated air-cooled induction regulator especially designed for the set. The range of the regulator was 100 per cent boost or buck so that the voltage applied to the transformer could be varied from zero to maximum. A suitable circuit breaker was used between the supply

TABLE I.—Break Down Voltage Test Triple-Braid Weather-Proof Wire.

Wire Size	Age in Years	Condition of wire	Break-down Voltage	
			Wire Immersed in water	Wire wrapped in Tin Foil
No. 2	1	Good.....	3,400	4,000
No. 2	2	Outside braid showing white threads, other braids black color.....	0	1,000
No. 2	3	All braids showing white threads.....	0	650
No. 4	1	All braids black color.....	0	700
No. 4	2	Outside braid showing white threads, other braids black color.....	0	1,000
No. 4	3	All braids showing white threads.....	0	1,000
No. 6	1	All braids black color.....	2,000	2,900
No. 6	2	Outside braid showing white threads, other braids slightly discolored.....	0	0
No. 6	3	All braids black.....	0	0
No. 2	New O. K.....		2,700	3,000
No. 4	New O. K.....		3,500	3,500
No. 6	New O. K.....		2,200	2,800

Note: The braids designated a black color, except No. 2 and No. 6 size, age 1 year, had only a very thin coating of insulating compound.

line and the regulator to break the circuit instantly when the insulation on test breaks down. On the high side of the transformer a voltmeter coil to which was connected a portable voltmeter permitted a direct reading of the high-tension test voltage with convenient accuracy and safety. Samples of wire to be tested were placed in a metal-lined tray 4 ft. wide, 5 ft. long and 5 in. deep filled with city hydrant water. One side of the high-tension winding of the transformer was connected to the metal lining of the tray and the other side to the end of the wire to be tested. The results obtained from this test were so startling that other tests were made without water by simply wrapping the sample of wire tested with tinfoil and connecting one side of the high-tension transformer to the tinfoil and the other side to the conductor. The results of this test appear in Table I.

Service

It finally was agreed by the committee that weatherproof wire should be used in urban or congested districts even though the protection offered by the insulation is questionable. In many cases one interruption to service in a heavily loaded district would offset the saving made by the use of bare wire and unquestionably the insulation in cases of this kind saves many interruptions. In rural territory the use of bare wire for 110, 220, 440, 2,300, 4,000 or 4,400 volts is used quited generally. Bare wire is not recommended for service wire in any case. When necessary to reinforce or change conductors with the circuits energized it is much more difficult to accomplish this work without interruption to service when bare wire is used, as the weatherproof wire often prevents burn-down when conductors swing together while stringing in. From the information received by the committee it would appear that service conditions were more favorable where insulated wire is used rather than the bare.

Cost

There are a number of items entering into the cost of constructing and maintaining weatherproof lines which do not appear when building lines where bare wire is used. Of course the greatest single item would be the saving in insulation. In using bare wire the span can be increased in length thereby effecting a saving in poles, crossarms and hardware; also the labor saving in erecting the supporting elements of the line as well as the labor saving on handling the conductors is appreciable. One company estimates a saving of 8 per cent in addition to the saving made in the use of bare-wire conductors. Another company has estimated that it could reduce its store stock on wire \$26,000 if it were not necessary to carry a stock of weatherproof as well as bare wire. It is difficult to arrive at a figure comparing the two types of construction, but from the information gathered by the committee and from estimates prepared covering different types of construction it is believed that the saving would be approximately 10 per cent if bare wire were used rather than weatherproof. Table II shows the saving which would have been made by several member companies in 1925 if no weatherproof wire, excepting No. 8, had been purchased. The companies showing the small saving are the ones using bare wire at the present time quite extensively.

Appearance and Adaptability

Not taking into consideration the additional number of crossarms or height of poles that might be required in congested territory there seems to be no question that the appearance of the bare wire is better than that of weatherpoorf. As it is only a question of time until the insulating compound dries or migrates and no longer protects the braid from the weather, the action of the elements then soon causes the braid to rot and hang from the wire in festoons which attract the eye of the laymen and often cause adverse criticism toward the utility. Bare wire when new often attracts the eye due to the reflection of the copper but this soon becomes dark so that it is much less noticeable than the weatherproof wire. So far as the committee has been able to learn, there are no city or county ordinances requiring the use of weatherproof wire on distribution voltages. General Order No. 64 of the California State Railroad Commission specifies that all service wires must be insulated. Order No. 706 of the Electric Safety Orders issued by the Industrial Accident Commission of the State of California covers yard wiring. This order specifies that conductors of 600 volts or less shall have approved triple-braid or double-braid weatherproof insulation, or an equivalent thereto.

TABLE II. Saving Which Would Have Been Made in 1925 if All Wire Purchased (excepting No. 8) Had Been Bare

Member Company	Estimated Saving if no Insulated Wire Were Used	Per Cent of Total Cost of Wire Purchased
No. 1.....	\$171,896.00	15.8
No. 2.....	163,052.00	27
No. 3.....	2,000.00	.....
No. 4.....	2,650.00	.....
No. 5.....	6,000.00	.....

* This figure is for the years 1921-1922-1923; 1925 figure not available.

Testing High-Voltage Insulators and Live-Line Maintenance

By H. H. MINOR

High-Voltage Insulator Testing

A questionnaire was sent to most of the member companies covering their practice in insulator testing and live-line maintenance. Following is an outline of the answers received relating to insulator testing:

1. Q. Do you test pin type insulators after installation?
A. Two, yes. Five, No.
2. Q. If so: On lines of what voltage?
A. One, 22 and 24 kv. One, 60 kv.
Q. By what method?
A. One, glow-stick. One, spark coil.
Q. With lines energized or killed?
A. One, Energized. One, Killed.
3. Q. Do you test suspension insulators after installation?
A. Five, Yes. Two, No.
4. Q. If so, on lines of what voltage?
By what method?
With lines energized or killed?
A. One, 22 kv. to 165 kv. with glow stick; energized. Two, 60, 100 and 220 kv., megger and spark coil, killed. Three, 33 kv.; megger; killed.
Four, 15 kv. and up; megger; killed.
Five, 11 to 220 kv.; megger; killed.
5. Q. Do you experience any difficulty getting lines out of service for testing?
A. Four, Yes. Two, No.
6. Q. Have you experienced any difficulty from flashovers caused by testing on live lines?
A. One, No.
7. Q. Do you test insulators before installation? Describe briefly.
A. Four, Yes. Three, No.
Two, A.I.E.E. flashover test.
Two, megger.

Only one of the companies reporting uses live-line testing methods. They use the glow stick which will be referred to later. Four report difficulty in getting lines out of service for testing. This would indicate that a practical method of live-line testing would be welcomed by those companies. Four report that they test both pin-type and suspension units before installation, using a flashover test in two cases and megger in the other.

An interesting report on the Pacific Gas and Electric Company's practice and equipment used in testing high-voltage insulators by N. P. Carlsen, Jr., follows:

Testing High-Voltage Insulators on the Pacific Gas and Electric Company's System

There are three methods used by the Pacific Gas and Electric Company for testing high-voltage insulators. They are the megger test for suspension units, the spark coil and portable transformer set for pin-type units. All of these methods are used only when the line is dead.

Megger Set

The megger test is used entirely on suspension units. The megger set consists of a 5,000 megohm megger, a set of prongs and a suitable duplex cord together with a 3-legged leveling stool. The test is performed by setting up the megger at the base of the tower or pole and connecting the duplex cord to the megger and prongs. After this the prongs are mounted on a suitable rod and taken up the pole or tower by a lineman. Prior to contacting the insulators with the prongs a check is made of the resistance of the cord and prongs and the megohm reading is noted. This reading governs the reading at which a unit should be passed or rejected. After making this check the prongs are shorted to ascertain whether the megger is reading correctly after which each unit is bridged by the prongs and the megohm readings recorded. The man operating the megger must be an experienced man who can tell by the readings recorded whether or not to replace a unit. A record is kept of each unit, including the type and manufacture. When a unit is found to be defective it is marked with a blue crayon and changed as soon after testing as possible. The defective units are gathered together and a check test is made on the ground. This check test proves conclusively the condition of the unit.

Spark-Coil Set

The spark-coil test set consists of a high-voltage coil, 12 volts primary to 60 kv. secondary and a vibrator. This coil, while large, is portable enough to permit transporting it along the pole-line right-of-way. The primary source of power is a 12-volt storage battery.

In testing, long leads from the coil are attached to prongs, the coil is set up at the base of the pole and the cords attached after which the prongs are sent up the pole. One shell is tested at a time by placing a prong on the top and bottom ring of cement and applying voltage. The voltage applied is governed by a spark gap adjustment on the coil. A defective shell is picked by the lack of a spark across the gap. When this set is used on a line along a road the set is mounted on a light car. When used in hilly country it is mounted so that two men can carry it from pole to pole.

Portable Transformer Set

The portable transformer set consists of two X-Ray transformers having a ratio of 480/1 and connected in series-parallel. The low voltage is controlled by means of a miniature hand regulator which has a range from 10 to 120 volts, giving a testing voltage of from 9.6 to 114.2.

In testing insulators with this set the units are set upon an insulated platform and the voltage is applied through brass prongs insulated from the hands of the tester by means of bakelite rods 3 ft. long. The voltage applied is measured by a voltmeter in the primary, calibrated for the secondary voltage. This set is used primarily for big reconstruction jobs and for cleaning up warehouse stocks. It has been in use for a period of three years and is giving satisfactory service.

Glow Stick

The Great Western Power Company uses the glow stick in testing on 22 kv. and 44-kv. lines. This device is a development of that company and has proved very satisfactory. It was described in the committee report for 1924-5.

There are available several other devices for live-line testing as well as for testing on dead lines. A brief description of some of these is given in the following paragraphs.

Oscillator Method

For dead-line testing an oscillator method is described by L. A. Wildman of the West Virginia Water & Electric Company in a recent publication as follows:

This testing set as developed consists of the following elements: (a) A 60-cycle step-up transformer; (b) a condenser placed across the terminals of the high-voltage coils of the transformer; (c) an adjustable spark gap; (d) an oscillation transformer, oil immersed, without iron core, consisting of a few turns on the primary and many turns on the secondary. The regulation of this transformer is made as good as can be obtained and, unlike the wireless outfits, there is no dependence placed on obtaining resonance for the ordinary tests; (e) a sphere gap made up of spheres of a diameter equal to the maximum air gap; (f) a suitable reactor to protect the step-up transformer against the damaging effect of short-circuit when a spark takes place on the small gap.

The ratio chosen for the 60-cycle transformer is 110 volts to 13 kv. Both are standard and 13 kv. is high enough to give good effects in the oscillator of the set large enough to test ordinary single-unit insulators. This outfit is capable of producing a voltage represented by a setting of 125 kv. on the sphere gap, and is capable of operating at this value continuously all day long. This is the testing set recommended for general use. For testing single units of lower voltage insulators a smaller set can be built to meet the special needs.

The main frequency of the natural oscillation of such an outfit without the secondary of the coreless transformer in place is about 200,000 cycles per sec. The range of high frequency recommended for testing is from 150,000 to 400,000 cycles per sec. Maximum rate of discharge should not be less than 1,000 kva. This maximum rate of discharge is not dependent on the kv. rating of the 60-cycle transformer, but depends mostly upon the electro-static condenser.

The foregoing data cover the characteristics of a testing set that is capable of testing most of the insulators in use. It is easily built and gives satisfactory operation.

Buzz Stick

Probably the buzz-stick method of line testing is familiar to most. The tools used consist of a long insulating wooden handle upon which is mounted a metal point or prong. This is called the "feeling stick." A second wooden handle has an adjustable metal horn like a two-tined pitchfork attached to it. This is called the "shorting stick."

The process of testing consists of two distinct steps. First, the feeling-out process and second, the shorting-out process. The first employs the feeling stick and the second the shorting stick. The feeling-out process is used to determine the general condition of the string and to tell if there is danger of causing a flashover by the use of the shorting method. The cap of each successive insulator is touched with the metal prong on the feeling stick and the intensity of the "buzz" from the capacity spark noted. This buzz should grow weaker as the stick is moved away from the conductor. If the same intensity is noted in two adjacent units it may be suspected that one of them is faulty. If too many units seem faulty in a string it may be dangerous to proceed with the shorting-out test. If not, the units are shorted out one at a time. The lack of a spark denotes a faulty unit.

Miscellaneous Devices

Another development is the Doble equipment. This consists of a telephone head-set connected by a hollow tube of high insulating value to a sound chamber in which is located an adjustable spark gap connected through a condenser to terminals that span the unit under test. The spark gap is set for a good insulator and the comparison of sound indicates the condition of the insulator under test.

The Aislometer is a foreign development. It is described in the article by Mr. Wildman referred to above, as follows:

This is a device and method developed in Europe and one that has given very good results on live-line testing. It operates on the electrostatic principle similar to the electrostatic voltmeter and is a simple device consisting of a round tube 4 in. in diameter fitted with a transparent unbreakable cover and mounted on an insulating base carrying two high-tension terminal bushings. Contact is made to the insulator parts by two coiled spring terminals which lead through the bushings to the inner surface of the insulating base and are in contact with a light, pivoted, well-balanced electrostatic element that is free to move and when contacted with the first insulator under test furnishes the indi-

cation of a good or bad unit. The indication is positive in that the device when properly adjusted indicates either bad or good and no different grades in between. It is claimed by the manufacturers of this device that it is so built and calibrated that it is practically independent of ordinary atmospheric conditions and disturbing influences that might make testing by other methods less valuable.

A more recent development and an instrument that gives promise of being satisfactory is the Iler Insulator Tester. One of these instruments is being tried by the Southern California Edison Company and E. R. Stauffacher of that company promised a report on its action.

Live-Line Maintenance

The second subject assigned to this committee was live-line maintenance. This also is being studied by a subcommittee of the national overhead systems committee under the chairmanship of J. K. Himes of the Dayton (Ohio) Power and Light Company. It was believed that as far as possible the work of this committee should tie in with that of the national committee. Therefore a questionnaire was sent out, patterned after one sent by Mr. Himes. The answers received were as follows:

- Q. Do you do live-line maintenance or construction work?
A. Seven, Yes. One, No.
- Q. On what voltage lines?
A. Up to 5 kv.: Seven, Yes. One, No.
5 to 20 kv.: Three, Yes. Five, No.
Above 20 kv.: One, Yes. Seven, No.
- Q. What method is used?
A. Up to 5 kv.: rubber, Seven.
5 to 20 kv.: insulated handled tools, Three.
Above 20 kv.: insulated handled tools, One.
- Q. What other work than insulator testing is done on live lines?
A. Make hot taps: Six, Yes. One, No.
Replace insulators: Five, Yes. Two, No.
Replace crossarms: Four, Yes. Three, No.
Set poles in hot lines: Five, Yes. Two, No.

LIVE-LINE MAINTENANCE REPORT
SAN JOAQUIN LIGHT & POWER CORPORATION YEAR 1925

WORK PERFORMED ON LIVE LINES MILES DRIVEN & TIME CONSUMED											IF LINES WERE KILLED TO DO WORK			
DISTRICT	DEAD-END INSULATOR CHANGED	PIN-TYPE INSULATORS CHANGED	FUSE CONTACT INSULATORS CHANGED	BROKEN PINS CHANGED	HOOK JUMPERS MADE PERMANENT	DEADENDS CHANGED FROM PINS TO STRAIN	JUMPERS TRIMMED AND REPLACED	NEW POLES TIED IN LINE	MILES DRIVEN TO PERFORM HOT WORK	HOURS REQUIRED TO PERFORM HOT WORK	TRANSFORMER BANKS OUT OF SERVICE	SWITCHES TO OPERATE	MILES TO DRIVE TO DO SWITCHING	HOURS REQUIRED TO PERFORM WORK DEAD
BAKERSFLD	328	115	40	42	268	8	333	117	1970	457	7488	600	5373	1365
CORCORAN	639	73	0	2	199	3	36	82	2993	428	9135	440	8366	703
DINUBA	440	66	64	4	355	10	202	100	2173	344	5919	762	4358	619
FRESNO	517	110	47	53	656	15	460	123	5040	1007	8522	1141	11935	2179
LOS BANOS	3	8	0	1	0	0	9	14	210	25	28	41	908	75
MADERA	302	32	21	18	74	6	656	45	5173	530	5091	466	7220	869
MERGED	2065	98	22	74	145	0	292	34	6053	735	5546	490	7494	1079
S. JOAQUIN	190	76	3	1	84	6	338	25	1450	264	4727	329	4555	424
SELMA	232	26	10	10	755	42	279	229	6275	795	21216	814	10503	1558
TAFT	423	95	7	6	50	0	115	43	3809	398	10318	437	5511	687
TOTALS	5139	699	214	211	2586	90	2720	812	35146	4983	77990	5520	66223	9555

LABOR SAVED- 572 CREW DAYS - MILEAGE SAVED- 31077 MILES - NUMBER OF INTERRUPTIONS SAVED- 77990 TRANSFORMER BANKS.

- Q. If live-line maintenance is not done how is service maintained during repairs?
- A. Section of loop-feed killed: Three.
 Duplicated feed: One.
 Shut-down: Two.
- Q. On what type of construction is live-line maintenance used?
- A. Towers or steel poles: One, Yes.
 Wood poles and wooden arms: Six, Yes.
 Wood poles and steel arms: None.
- Q. Is any record kept of work done by live-line methods?
- A. Two, Yes.
- Q. If so, can cost of such work be compared with same work being done with lines killed?
- A. Two, Yes.
- Q. Does record show service interruptions obviated?
- A. Two, Yes.
- Q. How many men in live-line crew?
- A. Two, 3 men. Two, Regular crew.
- Q. Do they receive extra pay?
- A. No.
- Q. Do you have any system to prevent re-energizing a circuit upon which a live-line crew is at work?
- A. No.
- Q. Have you had any serious or nearly-serious accidents directly chargeable to live-line work?
- A. Three, No.

The above answers show that comparatively few companies work lines hot above 5 kv. Of those reporting, only two, the San Joaquin Light & Power Corporation and the Midland Counties Public Service Corporation, do any amount of work on such lines when energized. The San Diego Consolidated Gas & Electric Company reports some live-line work on 11-kv. lines with W. T. safety tools. The tools used by the San Joaquin Light & Power Corporation and the Midland Counties Public Service Corporation are the San Joaquin tools. Both are insulated wooden handled tools. The San Joaquin Light & Power Corporation uses these tools on 11-kv. lines continually and to some extent on 33-kv. lines.

The San Joaquin Light & Power Corporation has the most complete "hot-wire-work" organization of any of the companies reporting. In each of their districts there is a hot-wire crew of two linemen and one groundman. This crew is supplied with a commercial-

type truck equipped with tool and material boxes. This crew performs the hot work on all lines above 2.3 kv. and in addition does a great deal of patrol work. They work with the regular line crews or substation construction crews when hot work is to be done in connection with other work. A very complete record of their work is kept by the foreman. This report is rendered to the distribution superintendent's office monthly.

A recapitulation of these reports is made in that office, both monthly and yearly. This report for 1925 is shown in Fig. 1. It may be noted that the character of work done is listed, together with the miles driven and time consumed. The report also includes an estimate of the mileage and time that would have been necessary to perform the same work if the lines had been killed. Also the number of switches that would have been operated and the transformer installations that would have been interrupted is shown. This last is taken from an actual count from the district distribution maps and therefore is not an estimate.

The reports show that live-line maintenance is almost universal on lines up to 5 kv. The same reasons that make this advisable apply to distribution lines of higher voltage as well as to transmission lines in many cases. The only argument that can be advanced against such work on higher voltage lines is that the hazard to the workmen is too great. Mr. Himes indicates that the reports so far received by his committee are to the effect that this reason is given by most for not doing live-line maintenance on lines of higher than 4.6 kv. This argument seems to be refuted by the reports of those using hot-wire tools on medium-voltage lines. The answers received by this committee show that no accidents or near accidents have occurred that can be charged to live-line maintenance. The demand of the public for uninterrupted service coupled with increasing load density, which makes higher distribution voltage advisable, are forcing the operating companies to live-line maintenance. The problem to be solved is to make this hot work as safe to the workmen as is possible. The answers seem to be the selection of proper tools, careful selection and training of the men who use them and close supervision of the work.

Prime Movers Committee Reports*

Liquid and Gaseous Fuels**

The burning of liquid and gaseous fuels continues to be of prime importance to this western geographical section, since these are the only fuels available. Fuel oil is burned exclusively in northern California, natural gas is burned in the San Joaquin Valley, and in southern California. These two principal fuels are burned at different times of the year, natural gas whenever it is available and fuel oil at other times.

In connection with the burning of fuel oil the methods of testing and handling the oil are of considerable interest and brief reference therefore will be made to some of the more important facts in this connection before giving the data gathered in regard to the actual burning of the fuels.

*J. W. Andree, Southern California Edison Company, chairman. C. W. Wiggins, San Diego Consolidated Gas & Electric Company, vice-chairman. General Electric Company: R. F. Monges, E. E. Valk. Great Western Power Company: H. S. Markey. Hunt, Mirk Corporation: P. M. Robinson. Los Angeles Gas & Electric Corporation: F. R. Knight. R. F. Leefeld, E. G. MacDonald, Weller Reed, J. G. Rollow, C. H. Zeise. Pacific Gas and Electric Company: J. M. Brennan, L. D. Burlingame, C. H. Delany, F. T. Ellis, E. E. Mulkey, R. C. Powell, C. E. Steinbeck, J. H. Stott. San Diego Consolidated Gas & Electric Company: E. D. Sherwin. San Joaquin Light & Power Corporation: A. Y. Mendell, E. A. Quinn, C. P. Rhine, G. W. Thunen. Southern California Edison Company: C. P. Coultrap, H. L. Doolittle, L. J. Kraps, F. G. Philo, W. H. Short, W. E. Thompson. The Southern Sierras Power Company: V. E. Johnson. Westinghouse Electric & Manufacturing Company: R. A. Hopkins.

**Report of Subcommittee, C. H. Delany, chairman. F. T. Ellis, E. A. Quinn, E. D. Sherwin, W. H. Short, C. H. Zeise.

Fuel Oil—Standard Methods of Testing

Four of the companies questioned report the following standard practice, with one or two minor differences, for obtaining the average quality of fuel oil:

- B.t.u. content: bomb calorimeter.
- Per cent moisture: centrifuge test.
- Grit and foreign matter: centrifuge test.
- Gravity: Baume hydrometer.
- When tested: On each cargo of fuel received.

It is of interest in connection with the B.t.u. content that two companies report a decrease in the calorific value of fuel oil each year. One of these gives a total decrease of 3¼ per cent since 1921.

Fuel Oil Tanks—Fire Protection

Only two companies have fuel-oil tanks with floating roofs and these have been in operation for only a relatively short period of time. The opinion of these two companies, however, is that floating roofs are most desirable for fire protection purposes and are more logical than fire extinguishing apparatus. The former is more in the nature of a prevention than merely a cure as in the case of the latter method.

Fuel Oil Pumps and Heaters

The rotating type of fuel-oil pump is being used in the plants of the San Diego Consolidated Gas & Electric Company and the Southern California Edison Company. These pumps are giving satisfaction and are considered superior to the reciprocating type with the exception, mentioned by one company, that the packing gland requires more attention.

Automatic fuel-oil temperature regulators are used by two companies that report that they are of the opinion that the automatic regulator is not satisfactory over the wide operating range required by a power plant used either wholly or partly for standby purposes. Three of the five companies questioned report that manual control of fuel-oil temperature is quite satisfactory.

Since the introduction of the higher oil pressures used with mechanical atomizing, the importance of some method of detecting leakage in oil heaters has been increased greatly. A very satisfactory arrangement is in use by one company, as follows: The condensate from one heater discharges into a second heater and the condensate from this one discharges into an open tank where any leakage of oil may be detected immediately. When live steam is used for heating, the condensate generally re-evaporates as soon as it is discharged into the atmosphere due to the reduction in pressure. By means of the above series arrangement this objection is eliminated.

Air Preheaters and Water-Cooled Walls in Mechanical Atomizing Furnaces

The Los Angeles Gas & Electric Corporation is the only one on the Pacific Coast having any experience with air preheaters. The type installed by this company in its Seal Beach plant is the tubular, 3-pass type having a heater surface of 9.05 sq.ft. per boiler hp. The following operating data may be of interest.

time due to the load being cut down to standby conditions.

A stabulation of miscellaneous operating data in connection with mechanical atomizing furnaces is given in Table I.

Natural Gas Furnaces

Three plants are equipped for burning either fuel oil with mechanical burners or natural gas. The change from oil burning to gas burning can be made in a few minutes.

The efficiency while burning natural gas is reported by one company to be about 5 per cent less than burning fuel oil with mechanical burners. In Table II may be found some interesting data received from three companies. The San Joaquin Light & Power Corporation burns natural gas exclusively while the other two companies have to burn fuel oil at certain times of the year.

Instruments as an Aid to Combustion Control

The consensus of opinion appears to be that a reliable CO₂ and CO recorder is a great help in obtaining high efficiency. Out of five companies questioned, four are equipped with the chemical type of CO₂ and CO recorder, and two of these report that this type requires an excessive amount of attention. It is felt that the electric type of recorder is more desirable both from the standpoint of simplicity and reliability, although none of the companies have as yet had any actual experience with this type of instrument. One

TABLE I.—Mechanical atomizing furnaces

	Los Angeles Gas & Elec. Corp.	San Diego Cons. Gas & Elec. Co.	So. Cal. Edison Co. (Possibilities unknown. Have operated at 315 percent	Pacific Gas & Elec. Co.
1. Max. Rating Obtainable with Air Cooled Walls.....	292 percent	None	None	225 percent natural draft.
2. Experience with water cooled walls.....	None	None	None	None
3. Does adequate air cooling overcome spalling of Refractories.....	Yes	..	Not entirely	No.
4. What high-temp. cement or wash is used and with what results: (a) As a bond for bricks.....	["High Fire Bond" very satisfactory.	Argon EB & JM No. 31 very satisfactory.	..	{Argon high temp. cement and Stockton mixture, both satisfactory.
(b) As a refractory wash.....	["High Fire Bond" very satisfactory.	"Durox Fire Glaze" "Argon Facing Cement." No Results yet.	{JM No. 31 quite satisfactory.	{Durox Fire Glaze, Carboplastic cement.
(c) Method of application.....	..	Brush and with hands	Brush	Spray Guns.
5. What is Fuel Consumption to keep boiler hot per B. hp. (a) Mechanical Atomizing.....	{2545 B. hp. 0.019 bbl. per day.	{1166 B. bp. 0.0067 bbl. per day. 520 B. hp. 0.024 bbl. per day (old boilers—not comparable to the mech. atom. boilers).	{1500 B. hp. 0.005 bbl. per day. {777 B. hp. 0.008 bbl. per day.	{822 hp. 0.0043 bbl. per day.
(b) Steam Atomizing.....				
6. Does Steam Atomizing Burner permit a higher CO ₂ than Mech. Burner without causing more smoke?.....	{Yes, natural draft. {No, forced draft.	No, natural draft.		{Yes, natural draft better by about 1 percent. {Apparently better atomization with steam.
7. Reasons for either case.....		{Mech. New boilers..... {Steam—Old boilers {Tempered tips — last about one year.		
8. Material for Burner Tips.....	{Hardened and tempered tool steel. Renewals are seldom required.			

Temperature of air entering furnace: 250 deg. F. at standby loads. 350 deg. F. at 250 per cent rating.

Reduction in flue-gas temperature: Natural gas 223 deg. to 237 deg. F. Fuel oil 236 to 243 deg. F.

Boiler efficiency: Natural gas with preheater 84.5 per cent. Natural gas without preheater 79.9 per cent. Fuel oil with preheater 88.9 per cent. Fuel oil without preheater 84.7 per cent.

Pacific Coast companies report no experience as yet with water-cooled walls although three companies have stated their intentions of installing such equipment in the near future. It is the opinion of some that although water-cooled walls may not result in any greater gains in boiler efficiency than those obtained with air preheaters, the former practically will eliminate the refractory problem in mechanical atomizing furnaces and permit the use of a quite inexpensive brand of fire brick. It should be borne in mind, however, in connection with mechanical atomizing furnaces that the refractory problem is not serious with air-ventilated settings if the furnace brickwork is protected with a good high-temperature cement. Several brands have been used with varying degrees of success. The Pacific Gas and Electric Company as its station A, used a protective coating over a relatively cheap fire brick and at the end of five months' operation at fairly high ratings the furnace walls were in very good condition. Unfortunately, it has not been possible to continue the test for a greater length of

TABLE II.—Natural Gas Furnaces

	Los Angeles Gas & Electric Co.	San Joaquin Light & Power Corp.	So. Calif. Edison Co.
1. Max. furnace temp.....	{2405 deg. F. at 250 per cent rating.....	2400 deg. F.	{2700 deg. F. at 310 per cent rating
2. Maximum boiler rating obtainable.....	300 per cent.....	200 per cent	315 per cent.
3. (a) Comp. Efficiency with Fuel Oil—Mech. Atomizing.....	{Gas... {84.5 per cent..... {Oil... {89.95 per cent.....		{2½ per cent higher with oil
(b) Ditto—Steam atomizing.....			{Gas a little better
4. Brick trouble at high ratings.....	{No serious trouble as yet...	{No high ratings.....	None
5. Time to change from oil burning to gas burning...	{About 2 mins. per blower.....	{10 to 15 mins..... {When crowded beyond draft capacity, No pulsations with some type of burners.....	{About 5 min. per blower
6. Any pulsations when burning gas with natural draft?	{Only when trying to force boilers above furnace capacity.....		
	{Castings of gas burner warp and crack. Oil burner must be extracted while burning gas because oil in burner carbonizes and tips oxidize.		{One make quite satisfactory. Another is still being developed.
7. Experience with combination oil and gas burners...			

company is, however, contemplating the purchase of a combination electric CO₂ and CO recorder at this time.

Good results are reported with boiler meters although they require a fair amount of attention in order to keep them in good working order. Two companies report that the recording pyrometer on this meter is not very reliable.

In connection with electric steam flow meters, one company reports very good results with two different makes, while another reports some trouble with the pitot tube plugging and dirt short circuiting resistance rods on one make of meter.

Seal Beach Station, Los Angeles Gas & Electric Corporation; Station Details

By J. G. ROLLO

The Seal Beach station of the Los Angeles Gas & Electric Corporation is located on the Pacific Ocean at Seal Beach, Calif. The station grounds comprise some 15 acres, practically level. The installed capacity is 31,250 kw. The station was initially operated June 2, 1925. The building includes the turbine, boiler and control rooms and the offices of the plant. The basement elevation is +10 ft., the boiler room +20 ft., the turbine room +41 ft., offices and control room +27 ft., and the roof +119 ft. The foundation is on natural soil with fir piling and a reinforced concrete slab.

Following is something of a brief outline of the equipment and arrangement:

Main Apparatus

Turbine: 1 Westinghouse single-cylinder horizontal steam turbine; capacity 31,250 kw., r.p.m. 1,800 (1,500 for 50 cycle operation). Steam pressure 350 lb., superheat 264 deg. F. One electrically operated speed changer driven by Westinghouse d.c. motor; one auxiliary oil pump driven by steam turbine; two Griscom Russell oil coolers. Turbine main steam line has 1 motor-operated 18-in. Chapman valve, driven by General Electric d.c. motor, connecting turbo throttle to main steam header line.

Main generator: 1 Westinghouse a.c., 37,500 kva., 13.2 kv., 80 per cent power factor, 3-phase, 60-cycle, 1,800 r.p.m. (31,250 kva., 11 kv., 1,500 r.p.m. at 50-cycle operation).

House generator: 1 Westinghouse a.c., 1,562 kva., 2.4 kv., 80 per cent power factor, 3-phase, 60-cycle, 1,800 r.p.m.

Exciters: Two 200-kw. Westinghouse d.c. generators, compound-wound, 300-volt, 666-amp., 1,170-r.p.m., direct-connected to Westinghouse induction motor, 310 hp., 2.3 kv., 60-cycle, and to Westinghouse steam turbine, steam pressure 350 lb., 1,140 r.p.m., non-condensing.

Main transformer bank: Three single-phase, 12,500-kva. each, oil-filled and water-cooled, 110/13.2 kv., also rated for 50-cycle operation.

Auxiliary transformer bank: Three single-phase delta delta Westinghouse, 2,000-kva. each, 60-cycle, 110-kv., 2.4-kv., delta on 115.5 kv. and delta on 2.4 kv., also rated for 50-cycle operation.

Condenser Equipment

One Wheeler, 2-pass, split-type, surface condenser; cooling surface 45,000 sq.ft. of 1 in.x21 ft. 3 3/4 in. No. 16 BWG Admiralty-mixture tubes of British American Tube Co., Inc. Condenses a maximum of 300,000 lb. of steam per hour and circulates approximately 50,000 gals. of water per min. Tube plates are of Muntz metal 1 1/2 in. thick. Tubes in top half of condenser are arranged in vertical rows with extra-wide horizontal spacing. Those in the lower half are arranged in diagonal rows with standard spacing. Weight of condenser and contents, under normal operating conditions, is carried partly on the spring supports and partly on turbine exhaust flange, through the connecting piece.

Two 30-in. Wheeler horizontal, double-suction, single-stage, centrifugal circulating pumps each driven by 250-hp., wound-rotor, General Electric induction motor.

Two 6-in. Wheeler centrifugal hot-well pumps, each direct-connected through a flexible coupling to a 100-hp., 2.2-kv., wound-rotor, induction motor having a drip-proof cover. Capacity of each pump 800 gal. per min.

Two Wheeler steam-jet air-pumps, two-stage type, equipped with surface inter-coolers and after-condensers. Surface in inter-cooler 100 sq.ft. Surface in after-condenser 40 sq.ft. 427 5/8-in. Admiralty-mixture tubes, 2 ft. active length; 2 ft 2 1/2 in. total length. Tube plates of Muntz metal.

Boiler Room Equipment

Three B.&W. water-tube, cross-drum boilers, 25,450 sq.ft. heating surface each, equipped with B.&W. interdeck, three-loop superheaters. Evaporation for each boiler under normal operating conditions is equivalent of 175,600 lb. of water per hour from and at 212 deg. F. Maximum continuous evaporation for each boiler is equivalent of 263,400 lb. water per hour from and at 212 deg. F. Maximum working steam pressure 375 lb., gage at outlets of superheater. Each boiler has 860 4-in. tubes 24 ft. long, made of hot-finished, seamless steel and arranged 43 tubes wide by 20 tubes high. Thickness of tubes: two bottom rows No. 6 BWG; all other tubes No. 7 BWG. Each boiler has six 4 1/2-in. safety valves, steel body with Monel feathers and seats. Fuel burned is oil and natural gas. Boilers equipped with Peabody Fisher wide-range mechanical oil burners. Two Copes feed-water regulators on each boiler.

Two Kinney pumps, 112 gal. per min., driven by G.E. turbine through G.E. reduction gears.

Two sets Braun fuel-oil heaters, each set consisting of three units. Counter-current, floating-head, straight-tube. Oil is passed first through a heating unit which has for a heating medium the condensed steam from the other units, then through to the second unit which has for a heating medium the exhaust steam from turbines driving the fuel-oil pumps, then through the third unit which is fed with live steam controlled by a thermostatic valve adjusted to deliver steam at the required pressure and quantity to bring temperature of the oil up to a working range of 200 to 250 deg. F. Each set has sufficient capacity to heat 54,500 lb. of fuel oil per hour from 60 deg. F. to 250 deg. F.

Three Sturtevant "Turbo-vane" forced-draft fans; horizontal, 3/4 housing; top 45 deg. Capacity at maximum rating, 100,000 cu.ft. per min. at 200 deg. F. with a total pressure of 6 in. of water. Under these conditions there is 2-in. suction at fan inlet and 4-in. pressure at fan outlet. Each fan direct-connected through flexible coupling to G.E. adjustable-speed, brush-shifting, 3-phase motor. Air supply is drawn from outside through pre-heaters and duct line to fans and is conveyed by ducts from fans to boilers.

Two Worthington horizontal feed-water pumps, double-suction, motor-driven, centrifugal, 6-stage, 1,000-gal. per min., speed 1,800 r.p.m., 450-lb. discharge head.

One Worthington horizontal feed-water pump, double-suction centrifugal, turbine-driven, 4-stage, 1,000-gal. per min., speed 2,100 r.p.m., 450-lb. discharge head.

Four Griscom Russell bleeder type feed-water heaters, horizontal water-tube closed-type with floating head. Used in connection with turbine for heating feed water. Four-stage bleeding heating system is used. Condensate is passed first through system which absorbs heat from generator cooling air, from bearing and transformer oil and from condenser air ejectors. It is then passed through a system of four closed heaters in which its temperature is increased to about 360 deg. F. Steam for these heaters is provided by bleeding from turbine.

Fuel Oil Tanks

One steel fuel-oil storage tank; capacity 55,000 bbl., with heating coils and floating roof. Situated above ground.

Two service tanks; capacity 2,000 bbl. each, reinforced concrete. Situated underground.

Two Byron Jackson fuel-oil pumps; 350 gal. per min. each, 140-ft. head, 1,750 r.p.m., direct-connected to G.E. 25-hp., 3-phase, 1,800 r.p.m., induction motors. These pumps pump from storage to service tanks.

Cooling System

Cooling water taken from bay through two traveling water screens. They are self-cleaning type with renewable wire screens, provided with a water spray system for removing debris into a refuse trough. Each screen is capable of cleaning 35,000 gal. of water per min. at normal operating speed. Link Belt Company, manufacturers.

Air Compressors

One Gardner Rix, 4½x4½-in., 300 to 500 r.p.m. Maximum pressure 200 lb., driven by 5-hp. G.E. induction motor.

One Ingersoll Rand 12x12-in., belt-driven by G.E. 75-hp. induction motor.

Turbine-Room Crane

One Whiting Corporation 4-motor, electric traveling crane with main hoist capacity of 100 tons and overload capacity of 120 tons provided with auxiliary hoist having capacity of 20 tons. Span 62 ft. 11 in. center-to-center of runway rails. Top of crane 40 ft. above turbine room floor. Automatic electric brake provided on each hoist, so constructed that it will operate instantly when electric power is cut off or fails.

Fire Fighting Apparatus

One Lux, electrically controlled, 16-tank, carbonic-gas, transformer-oil fire protection system. La France and Foamite chemical engines and 1-gal. Phister extinguishers are installed in different locations throughout plant.

Air Pre-Heaters

Three B.&W. tubular, 3-pass; used in connection with the three boilers. Each pre-heater has ½-in. thick top tube-sheet and ¾-in. thick bottom tube-sheet. There are 1,972 No. 11 gage tubes, 18 ft. long, so arranged that gases pass upward inside tubes and air passes downward outside tubes, making three complete passes over tubes. Total effective heating surface of each heater is 23,025 sq.ft.

Stack

One reinforced concrete stack 375 ft. in height, above the boiler room; 32½ ft. inside diameter at base.

Instruments

Foxboro temperature and pressure gages.

Leeds and Northrup temperature recorders for pre-heater gas.

Simplex venturi meters for water-flow, feed-water and condensates.

Republic flow meters, for natural gas.

Bassler liquid meters for fuel oil.

Tag Mono Duplex CO₂ recorders.

Frahm reed tachometers.

Esterline-Angus recording tachometer. (For speed of turbine and generator.)

G.E. flow-meter, measuring steam to turbine.

Westinghouse graphic meters in control room.

Power Station Heat Balance- Preliminary Report*

By F. G. PHILO and L. J. KRAPS

The trend of proved developments of power-station heat balance and arrangement of station auxiliary equipment is well represented in the Pacific Coast section by the Seal Beach station of the Los Angeles Gas & Electric Corporation and the two sections of the Long Beach steam plant No. 2 of the Southern California Edison Company.

Fig. 1 illustrates the essential points of the heat-balance arrangement of the Seal Beach plant. Fig. 2 gives the heat balance arrangement for units Nos. 7 and 8 of the Long Beach steam plant. Fig. 3 illustrates the heat balance for unit No. 9, Long Beach steam plant No. 2.

Heat-balance arrangements of the later steam stations, of which the above are typical examples, are possible to the fullest degree only by the use of electrically driven auxiliaries. Electric drive has proved thoroughly its economy, dependability and freedom from excessive maintenance.

The use of steam drive now is usually confined to emergency equipment such as fire pumps, relay drive

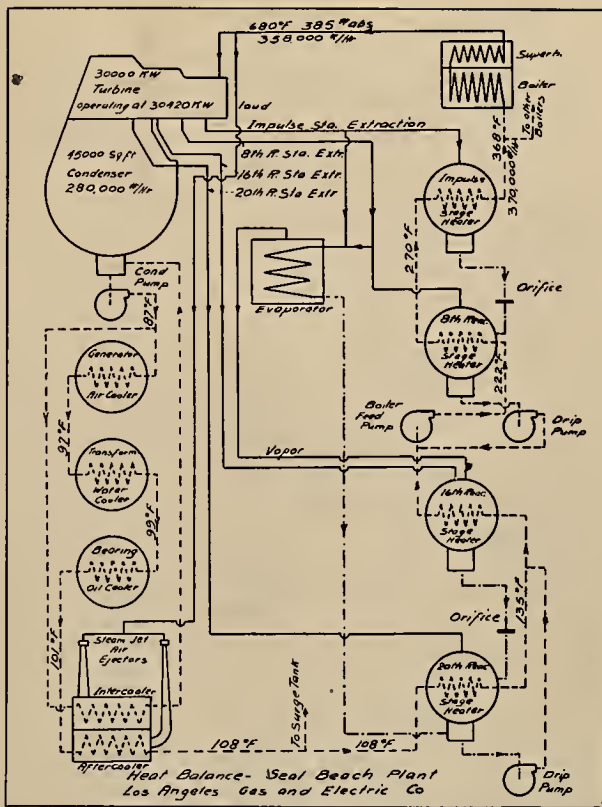


Fig. 1. Heat-balance diagram of the Seal Beach plant of the Los Angeles Gas & Electric Corporation.

for exciters, emergency boiler-feed pumps and fuel-oil or other pumps the exhaust of which may be used near at hand for heating or drying operations.

Selection of Heat-Balance Arrangement

The proper selection of a heat-balance arrangement should weigh thoroughly the factors of first-cost, operating economy, dependability, flexibility and maintenance. Equipment frequently must be selected and operated in a manner that would not be thermally justified.

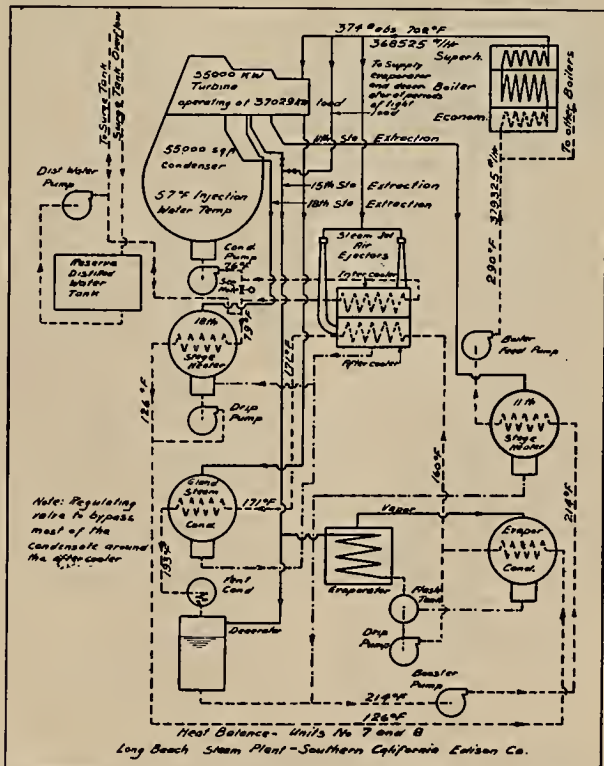


Fig. 2. Heat-balance diagrams of the No. 7 and 8 units at Long Beach steam plant of the Southern California Edison Company.

* Report of subcommittee.

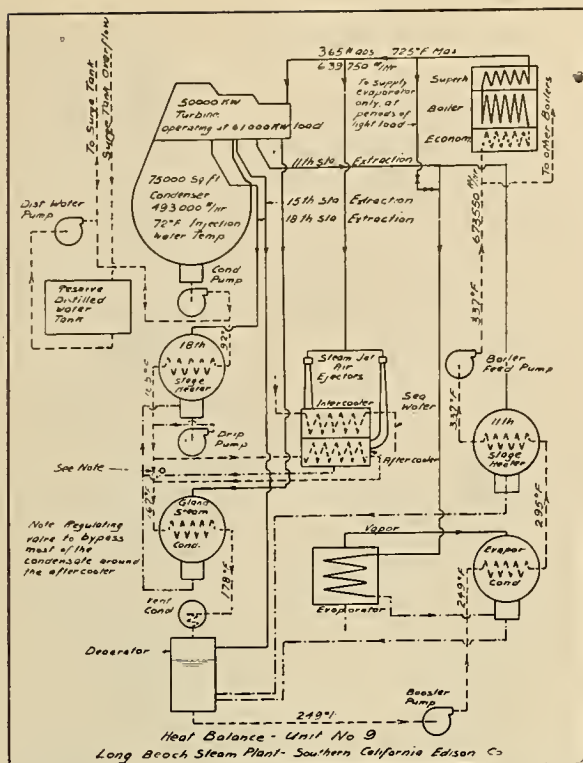


Fig. 3. Heat-balance diagram of the No. 9 unit at Long Beach steam plant of the Southern California Edison Company.

Extraction Heaters

The use of three stages of extraction has become quite general. A fourth stage of extraction is used occasionally, but is possibly justified only in stations of high fuel cost or high load factors. In addition to the normal extraction heaters, processes such as heating, operation of make-up evaporators, and the deaeration of boiler feed are conducted usually by extracted steam.

Steam from a higher turbine stage or live steam through reducing valves may be used for evaporator and deaerator operation during periods of very light turbine load. Evaporators, deaerators and similar equipment usually operate in parallel or series with the normal extraction heater from the stage whose normal pressure and temperature is best suited to the operating conditions required. The economy derived from the operation of evaporators, deaerators, etc., in series with a normal extraction heater is the same as if the entire range of heating from an individual stage took place in a normal heater operating alone.

Fig. 4 shows the pressure-load relation in stages 11, 15 and 18 of turbo-generator No. 8 at Long Beach station No. 2. It is interesting to note that the turbine stage pressures for all practical purposes are straight-line functions of turbo-generator load. This characteristic is very useful in the estimation of stage pressures other than those known. The straight-line relation between stage pressures and turbo-generator loads also facilitates the estimation of stage temperatures other than those known, providing the temperatures to be estimated all are saturated-steam temperatures.

Fig. 5 shows the relation existing between stage temperatures and turbo-generator loads in the same turbine. Extrapolation of stage temperatures may be made from the temperature-pressure relation obtained from the given or calculated stage pressures, providing the temperatures involved all are those of saturated steam.

Cooling of Turbine and Transformer Oil

Turbine and transformer oil may be cooled by sea-water, raw water, condensate or air. The use of raw or river water usually is undesirable as such water usually is either prohibitive in cost or contains large amounts of organic matter and mud. As far as cooling efficiency is concerned the use of sea-water probably is most preferable. However, it has the disadvantage

of nourishing various marine animal and vegetable growths which adhere to and very often seriously obstruct piping and coolers.

The possibility of leakage of sea water into oil coolers requires very close watching but never has occurred in the Long Beach steam plant. Barometric legs are used on the sea-water lines leaving all coolers. This arrangement maintains sea-water pressures in the coolers below atmospheric preventing leakage of sea water into the oil system should leakage in the cooler surface develop.

The main argument in favor of the use of sea-water for turbine and transformer-oil cooling is that the temperature of sea-water usually is the lowest available and thus gives the maximum cooling capacity.

Condensate sometimes is used entirely or in conjunction with sea-water to cool turbine and transformer oil. This arrangement has proved quite satisfactory, but it is doubtful whether the complication of piping required for two systems in conjunction with a given generator or transformer is justified.

Cooling Generator Air

Sea water, when available, also is the most efficient cooling medium for generator air. Its disadvantages are the same as noted above. Where the maximum continuous turbo-generator capacity is limited by generator-air cooling the use of water at the lowest temperature increases turbo-generator capacity considerably.

Thermal Gain Effected by the Use of Condensate for Cooling Purposes

Heat picked up by the condensate in the passage through various coolers displaces steam which might have been extracted from the lowest bleed-point of the turbine. The net thermal gain obtained by using condensate for such cooling purposes therefore is a differential between the recovery of miscellaneous heat losses and the gain that could be made in the extraction cycle by using a greater amount of extracted steam in the lowest temperature heater, if these miscellaneous heat pickups had not been made previously.

Steam Jet Air Ejectors

The steam-jet air ejector is a piece of equipment the use of which is not thermally justified, but its dependability and freedom from maintenance have established it in quite general use. The indirect thermal loss occasioned by the slight heating of feed water with the exhaust from the steam-jet air ejectors instead of using bled steam is more than outweighed by the compactness, reliability and low first-cost of this piece of equipment.

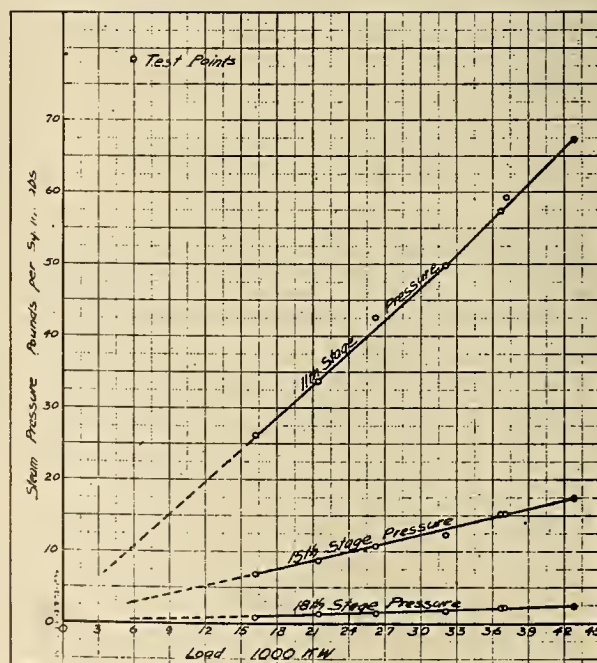


Fig. 4. Stage pressures of No. 8 unit when extracting, Long Beach steam plant of the Southern California Edison Company.

Effect of Feed Water Temperature on Station Economy

If economizers are not used a net thermal gain for the station is made by heating the feed water to the saturated steam temperature existing at the boiler with extracted steam. However, if the economizers are used the maximum boiler-room efficiency is obtained with the lowest feed-water temperatures.

With an arrangement of economizers and extraction heaters the gain from the use of extracted steam is the maximum when the gain from the use of the economizer is at the minimum. Consequently, in such a case there is a maximum extraction temperature to

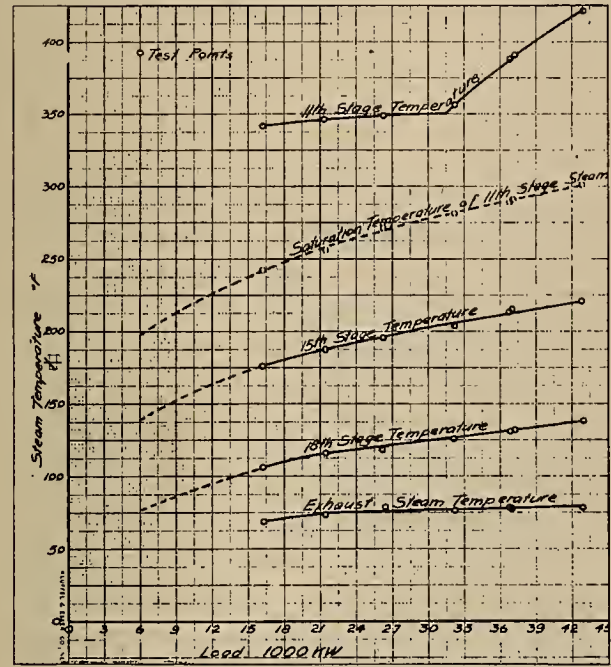


Fig. 5. Stage temperatures of No. 8 unit when extracting, Long Beach steam plant of the Southern California Edison Company.

which a system should go. This temperature usually is about 325 deg. F. in a 350-lb. 700-deg. F. non-reheat station.

Combination of Air Preheaters and Economizers

A combination of air preheater and economizer may be used which largely will combine the desirable features of both the air preheater and economizer. The total space occupied by the economizer and air preheater will be somewhat smaller than that occupied by a large air preheater of equivalent total capacity.

With the completed report on station heat balance the various subjects mentioned above will be dealt with more quantitatively. Considerable operating data also will be included in the final report, which also will jointly cover the subject of Station Auxiliaries.

Midway Steam Plant of the San Joaquin Light & Power Corporation*

By R. A. WALLINGFORD

Station Arrangement—No. 1 Unit

- A. Turbine and Generator: Horizontal, impulse-type, Curtis. 250 lb. gage steam pressure. 125 deg. superheat steam temperature. 28-in. vacuum. No bleeder points. Capacity: 10,000 kw. at 0.80 P.F., 12,500 kw. at 1.00 P.F. (See Appendix, Note, 1.) Water-rate curve guaranteed: 5,000 kw.-13.55 lb., 7,500 kw.-12.65 lb., 10,000 kw.-12.5 lb., 12,500 kw.-12.75 lb. Speed, 1,800 r.p.m., 60-cycle, 11.5 kv. Placed in service May 4, 1921.
- B. Condenser: 2-pass, surface-type, Wheeler Condenser & Engineering Company. 30,000 sq.ft. cooling surface. 5,729 Admiralty metal tubes, 1 in. outside diameter, 20 ft. 5 in. long. Tube arrangement: uniform spacing in each pass, with steam lanes. Me-

- talic packing with ferrules. Circulating water required for 28½-in. vacuum depends largely upon temperatures and would not justify any definite statement as to volume; however, provision is made for 24,000 gal. per min. Head-loss through tubes approximately 7 lb. when pumping 24,000 gal. per min., varying with volume of circulating water. No electrolytic protection.
- C. Air-Removal Equipment: Two-stage jet Evactor with single 8-in. air intake, Croll Reynolds Company, Inc. Position of air pipe leaving condenser: one 8-in. line from side of condenser shell 30 in. below center, under dry-air baffle. No figures available on steam consumption. (See Appendix, Note 2.)

- D. Condensate Pumping Equipment: Two single-stage volute, Wheeler Condenser & Engineering Company: One driven by 25-hp., 440-volt G.E. induction motor, one driven by 25-hp., non-condensing-type G.E. turbine 100-ft. pumping head.
- E. Turbine Oil-Cooling and Purifying Equipment: Tubular-type Schutte & Koerting fresh-water cooler. R.P. filter-type, continuous bypass oil purifier. (See Appendix, Note 3.)
- F. Turbine Air-Washing and Cooling Equipment: Water-curtain type, capacity 30,000 cu.ft. of air per min. Single-stage volute pump driven by 10-hp. motor. Stirling air-purifying and cooling system supplied by Blumfeldt & Ropp Company, Chicago.

- G. Exciters: One G.E. motor-driven, 250-hp., 250-volt, 680-amp. One turbine driven through G.E. reduction gear, 3,600 to 1,200 r.p.m.
- H. Circulating Water Equipment: One 30-in., 24,000-gal.-per-min. Wheeler Condenser & Engineering Company pump. Drive: 500-hp. Curtis steam turbine through G.E. reduction gear, 3,517-1,060-350 r.p.m. (See Appendix, Note 4.) Four hand-cleaned screens, each approximately 5x5 ft., San Joaquin Light & Power Corporation manufacture. (See Appendix, Note 5. Cooling system: spray pond with 360 2½-in. nozzles. (See Appendix, Note 6.)

I. Instruments, Steam Plant Only: Recording gages for steam pressure and temperature in header; vacuum in turbine exhaust; circulating-water temperature and pressure at condenser inlet; circulating-water temperature and pressure at condenser outlet; condensate temperature. Venturi meter for condensate volume. Indicating gages for steam pressure and oil pressures. Mercury columns for vacuum. (See Appendix, Note 7.)

J. Boilers and Superheaters: Babcock & Wilcox, Stirling-type M30 boilers with steam discharge from center drum. 8,224 sq.ft. heating surface, 260 lb. gage pressure. Babcock & Wilcox superheaters for 125 deg. superheat. Hair-pin tube with cores. (See Appendix, Note 8.)

No economizers. (See Appendix, Note 9.) Pressure drops through superheaters: at 95 per cent rating, 1 lb.; at 120 per cent rating, 1 lb.; at 130 per cent rating, 1 lb.; at 150 per cent rating, 2 lb. Pressure drops through Lagonda automatic stop valve: at 95 per cent rating, 1 lb.; at 120 per cent rating, 1 lb.; at 130 per cent rating, 2 lb.; at 150 per cent rating, 2 lb.

K. Furnaces and Burners: San Joaquin Light & Power Corporation design, natural-gas burners. (See Appendix, Note 10.) 306 burners arranged in six sections evenly divided over floor of furnace with separate air control to each section. Furnace volume: approximately 4,000 cu.ft. Burners installed for 200 per cent of rating in emergency and 150 per cent for normal operation. Furnaces built of Los Angeles Pressed Brick Company brick. (See Appendix, Note 21.) Thickness: side walls, 18 in.; center walls, 30 in.; front walls, 27 in.; rear walls, 18 in.; bridge, 31 in. Only sufficient ventilation of walls to protect steel work. Natural draft. Burners evenly distributed over entire furnace floor, directing flame upward.

L. Stacks: Steel, 90-in. diameter, 95 ft. high above top of boiler setting. No lining. Supported on boiler setting with two sets of guys. (See Appendix, Note 11.)

* Report prepared for the prime movers committee of 1924-25. Publication delayed.

M. Fuel Equipment: Pumps and heaters in duplicate. Duplex, $5\frac{1}{4} \times 4\frac{3}{4} \times 5$ -in. steam pumps from Snow Steam Pump Works, Buffalo. (See Appendix, Note 12.) 5,000-bbl. storage and service tank. Combustion control: pressure governor only, with individual regulation by hand at each oil burner. (See Appendix, Note 13.)

N. Feed-Water Equipment: Two 4-stage, centrifugal, 2,500-r.p.m., 4-in., 500-gal.-per-min. Allis-Chalmers pumps operating at 624-ft. head. Driven by G.E. turbines. Heaters: open, V-notch, recording type. Maximum capacity, 300,000 lb. per hr. Harrison Safety Boiler Works, Cochrane Company. Source of water supply: deep wells on station grounds. Reserve capacity, 50-bbl. tank on roof. No evaporators or deaerators.

O. Instruments, Boiler Room: Bailey boiler meter for each of eight boilers, recording steam flow, air flow and flue-gas temperatures. Mono-duplex CO₂ recorder for the eight boilers. One indicating and one recording pressure gage on steam header. One indicating pressure gage on feed-water line. One indicating pressure gage on low-pressure gas line. One indicating wattmeter on turbo-generator.

P. Piping Layout—Fan Type: Steam velocities approximately 6,000 ft. per min. at full load. No anchors. Expansion bends, single offset quarter-bend at boilers. Expansion U-bend in cross connection.

Q. Signal System: Solenoid-operated whistle with control at switchboard, for calls. Used also for signalling to firemen when making load changes. Also Klaxon horn in engine room operated from firing station in boiler room.

R. Foundation and General Data: Foundation; concrete mat, reinforced with railroad iron, 4 ft. thick, resting on hard-pan. Company has no data to offer on burning oil. Natural gas is fuel used and supply has been sufficiently satisfactory to give little call for use of other fuels. Plant is equipped for burning oil in case of emergency. For this purpose three Hammel burners are placed conveniently for quick insertion, connecting both steam and oil unions with sets of wrenches always kept with burners. When burning oil, burners are front-shot and gas-burner floor acts in a capacity similar to checker floor of oil-burner installations.

S. Gas Burners: No new developments. Capacities range to maximum of 200 per cent of boiler rating. Efficiencies range up to 84 per cent. Brick work stands up exceptionally well without any special construction or materials. (See Appendix, Note 10.)

Station Arrangement—No. 2 Unit

A. Turbine and Generator: Horizontal, reaction-type, Parsons. 250-lb. gage steam pressure. 125-deg. superheat steam temperature. 28-in. vacuum. No bleeder points. Capacity: 12,500 kw. at 1.00 P.F. (See Appendix, Note 15.) Water-rate curve guaranteed: 7,500 kw., 13.7 lb.; 10,000 kw., 13.3 lb.; 12,500 kw., 13.7 lb. 1,800 r.p.m., 60-cycle, 11.5 kv. Placed in service Aug. 1, 1922.

B. Condenser: Two-pass, surface-type, Allis-Chalmers. 30,000 sq.ft. cooling surface. 6,300 Muntz metal tubes, 1 in. outside diameter, 19 ft. 3 in. long. Tube arrangement: uniform in each pass with steam lanes. Metallic packing with ferrules. Circulating water required for 28½-in. vacuum depends too much upon temperature of circulating water to justify statement as to volume; provision is made, however, for 24,000 gal. per min. Head-loss through tubes, 3 lb. when pumping 24,000 gal. per min. No electrolytic protection.

C. Air Removal Equipment: Two 2-stage jet Evactors in multiple, with double 8-in. air intake, Croll Reynolds Company, Inc. Position of air pipes leaving condenser: two 10-in. flanged connections, one in each end compartment coming from side of condenser shell 10 in. below center, beneath dry-air baffle. Steam consumption, 3,000 lb. per hr. at 250 in. and 125 deg. superheat. (See Appendix, Note 16.)

D. Condensate Pumping Equipment: Two single-stage volute Allis-Chalmers, one motor-driven, one

turbine-driven. Capacity, 500 gal. per min. 100-ft. pumping head. 1,750 r.p.m. Size of driver, 25 hp.

E. Turbine Oil-Cooling and Purifying Equipment: Copper-tube, fresh-water, 6 sq.ft. Allis-Chalmers oil cooler R. P. filter-type, continuous bypass oil purifier. (See Appendix, Note 17.)

F. Turbine Air-Washing and Cooling Equipment: Water-curtain type. 30,000 cu.ft. per min. Sturtevant Company.

G. Circulating-Water Equipment: 24,000-gal.-per-min. Allis-Chalmers pump driven by 475-hp. Allis-Chalmers turbine through Westinghouse reduction gear, 2,200 to 550 r.p.m. Pumping head, 60 ft. (See Appendix, Note 18.) Screens same as Unit No. 1. (See Appendix, Note 5.) Cooling system consisting of cooling towers, 25,000 sq.ft. area with seven trays above surface of water. Designed and built by San Joaquin Light & Power Corporation engineers. (See Appendix, Note 6.)

I. Instruments—Steam Plant Only: Recording gages for steam pressure and temperature in header; vacuum in turbine exhaust; pressure and temperature of circulating water at condenser inlet; pressure and temperature of circulating water at condenser outlet; condensate temperature. Venturi meter for condensate volume. Recording gage for feed water temperature. V-notch meter for feed water volume. Indicating gages for pressures of oil, steam and turbine exhaust.

J. Boilers and Superheaters: Connely, type M30 boiler, D. Connely Boiler Company. 8,250 sq.ft. heating surface. 260-lb. gage pressure. (See Appendix, Note 19.) Foster-type superheaters. Hair-pin tube with cores and finished surface. Designed for 125 deg. superheat. (See Appendix, Note 20.) No economizers. (See Appendix, Note 9.)

K. Furnaces and Burners: Same as described for Stirling boilers of Unit No. 1. (See Appendix, Note 10.) Furnaces of Los Angeles Pressed Brick Company brick. (See Appendix, Note 21.) Thickness: side walls, 18 in.; front walls, 30 in.; rear walls, 18 in.; center walls, 30 in.; bridge, 31 in. Ventilation of walls as required by manufacturer to protect structural steel work in setting. No ventilation of floors. Natural draft.

L. Stacks: Same as described for Unit No. 1. (See Appendix, Note 11.)

M. Fuel Equipment: Same as described for No. 1 Unit.

N. Feed-Water Equipment: Four-stage, 2,700-r.p.m., 750-gal.-per-min., 635-ft. head Allis-Chalmers centrifugal pump driven by 200-hp. Allis-Chalmers turbine. (See Appendix, Note 22.) Heaters: open, V-notch recording type, 250,000 lb. per hr. maximum; designed and built by San Joaquin Light & Power Corporation engineers. Make-up from deep wells on station grounds. Reserve capacity, 50-bbl. tank on roof. (See Appendix, Note 23.)

O. Instruments—Boiler Room: Identical with Unit No. 1 except there are six boilers instead of eight. (See Appendix, Note 24.)

P. Piping Layout, Fan Type: Same as Unit No. 1. Hand-operated valves.

Q. Signal System: Described in connection with Unit No. 1.

R. Foundation: Same as for Stirling boiler of Unit No. 1.

Appendix

(1) Maximum rated capacity of No. 1 turbine is 12,500 kw. at 100 per cent P.F. under stated conditions of steam pressure, temperature, vacuum, etc., however, 13,100-kw. loads have been carried on this unit for various periods of time.

(2) The 2-stage jet Evactor recently installed on No. 1 Unit (replacing 3-stage steam-jet air-pump installed originally with this unit, but which apparently was of insufficient capacity to maintain the desired conditions except at very light loads), has been very successful in improving the conditions of operation over those encountered with original installation.

(3) The only data available on this cooler at the present time is a set of instructions for cleaning and installing. It is a very satisfactory operating piece of apparatus, never having failed to function with perfect satisfaction and never having required cleaning or repairing in the least.

(4) Original 290-hp. turbine of this pump equipment, which was increased to 400 hp. by remodeling nozzles, blading, etc., has been replaced by a 500-hp., D-51, G.E. turbine and reduction gear. A great improvement in the operation and conditions maintained on No. 1 Unit has been noted since the above changes in this pumping equipment were made.

(5) There is little occasion for any other than the simplest of hand-operated screens. During some times of the year they do not require cleaning more than once or twice a week. However, in the late summer there is a form of algae that forms quite rapidly during the latter part of each day and comes to the screens, suspended in the water, fast enough to compel cleaning about every two or three hours between noon and midnight. Between midnight and noon there is scarcely any collection upon the screens.

(6) After a year of operation with the spray-pond cooling system and with numerous comparisons with the tower system in use at Bakersfield plant under almost identical conditions it was seen that the towers would be most satisfactory for our use. That is why the tower system was installed for use with the No. 2 Unit.

(7) Changes to be recommended in this set of instruments, would be:

- (1) Dual record gage for steam pressure and temperature.
- (2) Dual record gage for circulating water inlet and outlet pressures.
- (3) Dual record gage for condensate and feed-water temperature.
- (4) Dual record gage for circulating-water inlet and outlet pressures.
- (5) Add steam-flow meter to turbine steam line.
- (6) Add steam-flow meter to auxiliary steam line.
- (7) Add dual record for pressure and temperature of auxiliary exhaust line.

(8) It is to be recommended that boilers be designed for pressures high enough that the proper pressure for efficient operation at all times may be maintained at the turbine throttle, allowing a variable pressure on the boilers considerably below the necessary safety-valve setting. This would minimize the tendency toward safety-valve leakage and consequently cutting, and maintain the highest turbine efficiency.

(9) Where fuel is as cheap as the natural gas used at this plant there is little occasion for the expenditure necessary for economizers. The saving that would be possible would not justify their installation.

(10) In the case of the gas burners installed under our boilers the capacity is somewhat limited due to restricted area at the air intake of the draft pit. The remedying of this and the addition of a few slight refinements in the burners themselves are to be recommended, though the present installation is highly satisfactory.

(11) There is one stack for each battery of two boilers.

(12) Natural gas is the fuel normally used. The pumps, heaters, etc., listed constitute our emergency oil-burning equipment.

(13) Our oil storage tank of 5,000 bbl. is connected directly to the oil line of the Union Oil Company through a meter and for this reason, and due to the fact that oil was for emergency use only, it was considered that this was sufficient capacity.

(14) The capacity of this turbine is rated at 12,500 kw. at 100 per cent P.F. but it has great overload capacities, having carried over 15,000 kw. for short periods and having carried over 14,000 kw. for days at a time under conditions far from ideal. This capacity for overload certainly is to be commended for emergency use, even though the plant efficiency be lowered

somewhat while making use of it. The average load for the month of August, 1924, was 13,619 kw. The average load for the entire month of September, 1924, was 13,996 kw.

(15) Installation of a larger size air pump than was used on the No. 1 Unit has justified fully the extra cost. Here we maintain a vacuum very close to the theoretical for the temperatures maintained.

(16) The cooling capacity of this piece of apparatus apparently is not as great as that in use on the No. 1 Unit, and requires a greater amount of care and cleaning.

(17) In connection with the circulating-water pumping equipment there is, in addition to that mentioned for No. 1 and No. 2 Units, an electrically-driven Byron-Johnson pump of 24,000-gal.-per-min. capacity with a 400-hp. motor which can be used on either No. 1 or No. 2 condenser in place of the turbine-driven pump.

(18) Connely boilers were installed on the No. 2 Unit after having used the Stirlings at the Bakersfield plant for a number of years and on the No. 1 Unit at Midway plant for a year. The change was made with due consideration by the management after all data, prices, etc., were submitted by competing companies. Their operation has been quite satisfactory, being easier to handle and showing less tendency toward priming. The latter no doubt is due to their discharging steam from the rear drum instead of the center, as in the Stirlings. However, there was a greater tendency for developing trouble with leaky seams, rivets, flanges, etc., than in the case of the Stirlings. Six boilers were installed on the No. 2 Unit whereas the No. 1 Unit required eight, six being the number required for operation of each unit with two for spare. The units being paralleled for normal operation permits the location of the spare boilers wherever desired.

(19) Foster superheaters are installed with the Connely boilers and give us a degree of superheat somewhat in excess of that expected. They are standard equipment with Connely boilers.

(20) Though this brand of fire brick may not have shown a high degree of satisfaction with some users that burn oil with mechanical atomizers, they have given our company very satisfactory service in connection with our gas-burning equipment.

(21) The feed pump installed with this unit was designed for capacity to feed the boilers of both No. 1 and No. 2 Units and is so operated whenever the plant is up to or near capacity. This operation is satisfactory and easily handled due to the two units being operated in parallel as a single unit.

(22) This heater operates in parallel with the larger one of No. 1 Unit whenever the load is greater than the capacity of the larger one. When the plant load is within the capacity of the No. 1 Unit heater, the No. 2 heater is cut out of service and the No. 1 heater allowed to carry the load for the entire plant.

(23) To the list of instruments shown for the boiler room it is to be recommended that the following changes be made:

- (1) Bailey boiler meters: Omit the flue-gas temperature recorder and substitute steam temperature recorder. Instances have come to our attention where there was evidence of a priming boiler that could not be located readily, and on account of this the trouble was not remedied as quickly as would be the case were individual temperature recorders used on the boilers. Moreover the flue-gas temperature recorder is the part of the Bailey boiler meter that is the most unreliable and most difficult and expensive to repair.
- (2) A mono-duplex CO₂ recorder should be installed for not to exceed four boilers.

Underground Systems Committee Reports*

Method of Repairing an Unleaded Submarine Power Cable

By GEORGE H. HAGAR

The all-rubber 11-kv. submarine cable laid by the Great Western Power Company in 1922 is a little over 7 miles long. It stretches from the north shore of San Francisco to Brooks Island where it connects with the overhead line from the Golden Gate substation in El Cerito. Since this cable was put into operation only one case of trouble has been due to electrical breakdown. The procedure in case of trouble is as described in the following paragraphs:

After clearing the cable from the rest of the system a preliminary location test is made using a decade-resistance set. This preliminary test is rarely

reliable due to the fact that the cable automatically is cleared from the system before the conductors have a chance to burn together, leaving an unknown high resistance at the fault. Generally it is necessary to separate a generator from the rest of the system, connect the same to the cable and bring up the voltage until approximately 400 to 450 amp. are flowing into the cable. This is continued until the ammeters show a steady reading. This burning takes from 20 min. to 2 hr. It is done in an attempt to burn the conductors together at the point of fault. Another location test then is made checking the resistance between conductors, between conductors and ground, and between telephone wires, in order to get an approximate location of the fault. While the cable barge is picking up the cable at this approximate location and placing it in the sheaves for under-running, an ordinary sign flasher is connected to the shore-end and resistance adjusted so that a direct current of from 120 to 150 amp. flows between the conductors and ground. On the cable barge is a turning coil of a split-coil type and a telephone head set. The presence or absence of the click in the telephone shows whether the barge is between the fault and shore, or beyond the fault. The cable then is underrun until the bad section of cable is on the barge.

The bad section then is cut out and a new piece spliced in. The splice requires the following material:

* P. E. Chapman, Pacific Gas and Electric Company, chairman. N. B. Hinson, Southern California Edison Company, vice-chairman. Coast Valleys Gas & Electric Company: G. A. Peers. General Electric Company: M. H. Schnapp. Great Western Power Company: G. H. Hagar. Los Angeles Bureau of Power and Light: M. O. Bolser, C. H. Jenkins. Los Angeles Gas & Electric Corporation: O. C. Miller, E. R. Northmore. Pacific Gas and Electric Company: H. H. Buell, G. L. Hill, H. G. Keesling, R. P. Lutzi, H. C. Moyer, Paul Suransky. San Diego Consolidated Gas & Electric Company: K. B. Ayres, D. J. Kelly. San Joaquin Light & Power Corporation: H. H. Minor. Southern California Edison Company: T. J. Lovell. The Southern Sierras Power Company: A. C. Putnam. Standard Underground Cable Company: Vinton Smith.

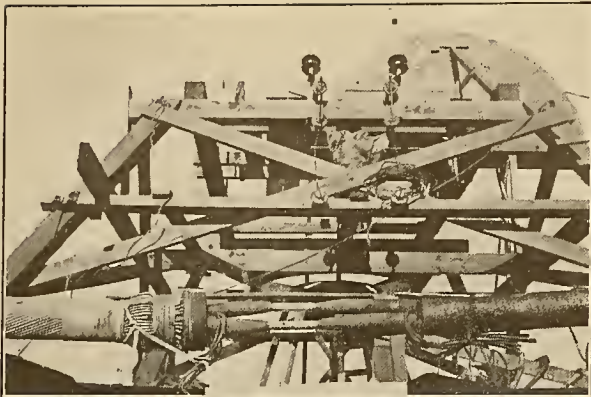


Fig. 1 Showing (above) the first steps in making the cable splice. One end of the turnbuckle sleeve is in place, armor served ready for zinc collar. Rubber penciled down, copper sleeve sweated on. For convenience the telephone pairs are tied back out of way. (Center) rubber tape in place. (Below) rubber-filled tape added to one leg; other legs completed ready for vulcanizing, iron moulds in place. Uniform thickness of rubber insured by use of three moulds.

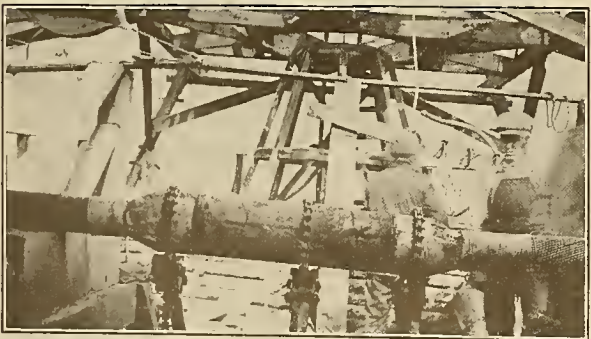


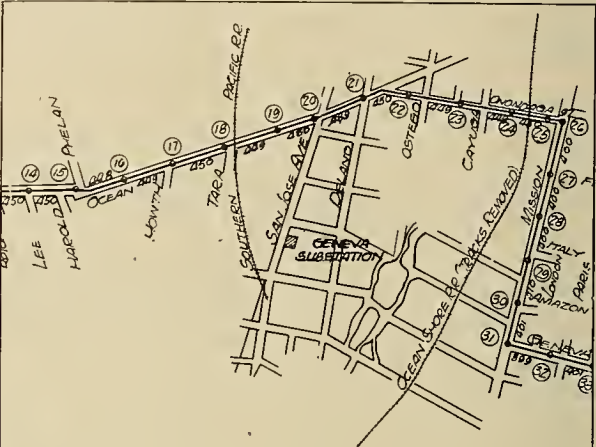
Fig. 2. (Above). Vulcanizing process. Tank is filled with beeswax which is maintained at 140 deg. C. for an hour and 40 min. Steam from the hoist engine is used to heat the tank. (Below.) Final screwing-up of the sleeve after the zinc collar has been cast around each end. Purpose of zinc collar is to fasten armor wires solidly to sleeve in order that all strain may be passed through sleeve and none placed upon copper conductors.

- 3 copper splicing sleeves, 500,000 circ.-mils.
- 1 lb. solder.
- 5 lb. 40 per cent rubber tape.
- 3/4 lb. rubber-filled tape.
- 3 sq.ft. of fish paper.
- 1 roll of white linen tape.
- 4 gal. of compound.
- 1 roll of asbestos tape.
- 1 turnbuckle sleeve.
- 50 lb. zinc spelter.

An Example of Electrolysis*

By PAUL SURANSKY and J. R. JENSEN

Station L, situated on Ocean Avenue east of Junipero Serra Boulevard, San Francisco, is an automatic substation with supervisory control from Station H on Walbridge Street east of Schwerin Street.



MAP SHOWING MANHOLE AND DUCT LINE LOCATION

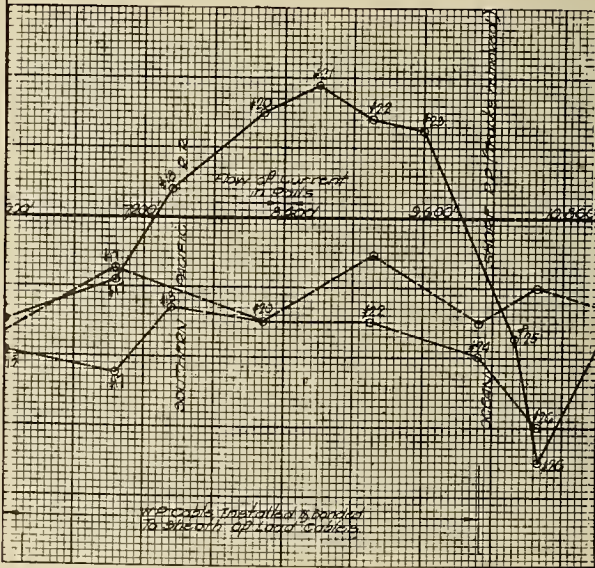


Fig. 1. Curves showing voltage relations of rail, cable sheath and water mains.

There are two 11-kv. cables and one telephone cable between stations H and L. These cables are 500,000 circ.mil in size and of 6/32x4/-32 in. paper insulation and 9/64 in. lead sheath. These cables supply energy to station L where it is stepped down to 4 kv. for distribution. The telephone cable is a 10-pair No. 19 B.&S. lead-covered cable, insulated with double-wrapped dry paper, 2 paper tapes over core, and 3/32-in. lead sheath. The telephone cable is used for supervisory control of Station L by Station H and for telephone communication between these stations.

*Special report of the Underground Systems Committee.

The distance between stations L and H by the route of the duct line is 4½ miles.

The duct line from Station L to Ocean Avenue and Paloma Street (manholes No. 1 to No. 3), consists of concrete ducts; from Ocean Avenue to Paloma Street to Mission and Onondaga Streets (manholes No. 3 to

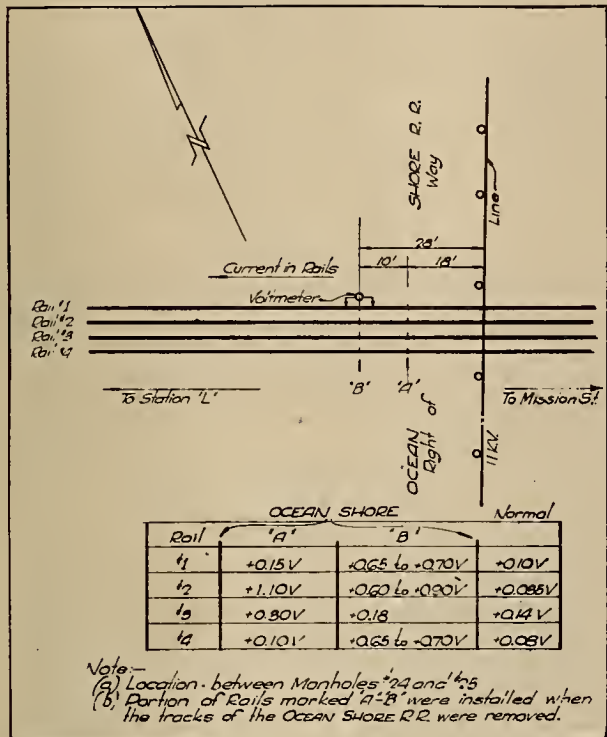


Fig. 2. Tests of bonding of street railway rails where Ocean Shore Ry. rails were removed.

26), consists of fiber ducts and from Mission and Onondaga Streets to Station H (manholes No. 26 to 58), consists of concrete ducts.

The three cables were installed and tested as satisfactory on Dec. 4, 1925. As Station L was not ready

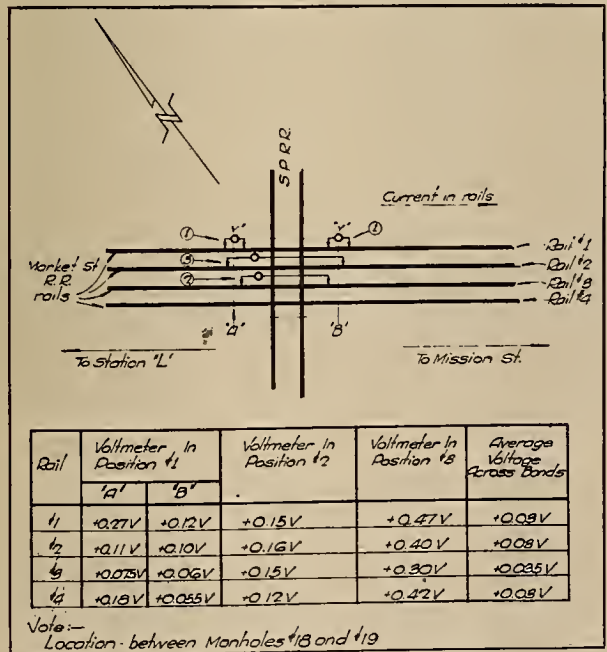


Fig. 3. Tests of bonding of street railway rails where Southern Pacific tracks cross street railway.

for supervisory control at that time it was operated manually and the telephone or control cable was not placed into service. On Feb. 20, 1926, the station was ready to be operated by supervisory control. However, when tests were made on the control cable it

showed a grounded condition. Upon investigation it was found that that portion of the control cable located between the Southern Pacific railway crossing and the old Ocean Shore railroad right-of-way (see Fig. 1, manholes No. 18 to No. 24), had been damaged by electrolysis and that the conductors were grounded.

This portion of cable was laid in a fiber duct line. The topography of the surrounding territory is such that all water drains toward this portion of the duct line. As the grounded condition was discovered after a rainstorm it is believed that previous to this the lead sheath of the cable had been destroyed by electrolysis and the water collected in the low portion of the duct worked its way into the paper insulation thereby grounding the conductors.

Voltage Tests

The duct line for its entire length between the stations parallels the rails of the street railway. In order to determine the extent of electrolysis voltage tests were made between cable and rail. These voltage relations are shown in Fig. 2. The lead sheaths of the three cables were bonded together at the time they were installed.

The curve obtained by plotting the above voltage readings indicated that the current, which had been returning on the cable sheaths, was leaving the cable and going to the rails between a point west of the Southern Pacific railway crossing, west of manhole

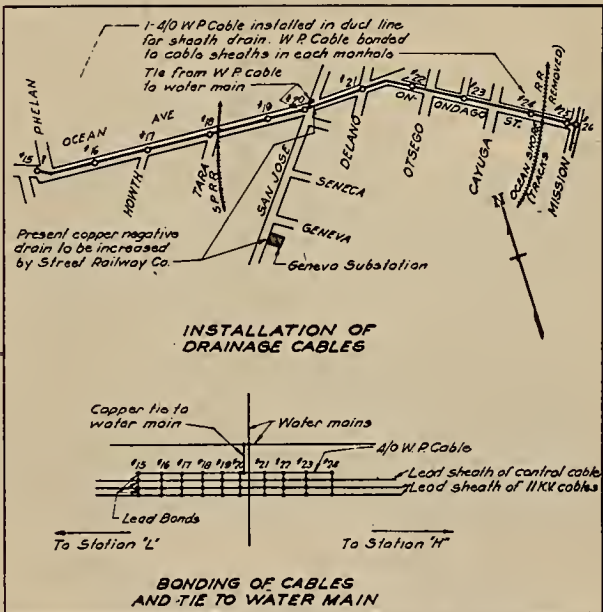


Fig. 4. Sketch showing installation of drainage cables, bonding of cables and tie to water main.

No. 18, Fig. 2, and a point west of the Ocean Shore railroad right-of-way, west of manhole No. 25, Fig. 2. This indicated that the cable sheath was being destroyed by electrolysis and that the condition would have to be remedied because the cables had been installed only 68 days previously and the sheath of one had been destroyed in that time.

Bond Tests

Since the curve obtained by the above voltages tests indicated that the current began to leave the cable sheaths at the Southern Pacific railway crossing and the old Ocean Shore railroad crossing, which had been removed, it was surmised that poor bonding of the rails may have been the cause of this condition. Therefore bonding tests were made at each locality and in the vicinity of same. The results of these tests are listed and the methods of testing are shown in Figs. 2 and 3. The tests show that at the Southern Pacific railway crossing, Fig. 3, the voltage drop across bonds was from 2 to 9 times the drop across the average bond in the vicinity, thus indicating that the bonds were very poor. At the location where the old Ocean Shore railroad crossing had been, tests showed the voltage drop across the bonds was from 2 to 8 times the drop across the average bond in the vicinity, thus indicating that bonding was very poor. It is believed

that the bonding at both of these localities is a divided contributing cause of the current leaving the cable sheath for the rail.

The Remedy

In order to reverse this flow of current from the cable sheath to the rail between manholes No. 17 and No. 25, a No. 4/0 weatherproof cable was installed between manholes No. 15 and No. 24. Larger bonds for tying the cable sheaths together were installed in each manhole and in turn these were soldered to the 4/0 cable, see Fig. 4. By doing this a low-resistance path was provided for the stray current to flow. The 4/0 cable was in turn connected to the water main nearby, near manhole No. 20, Fig. 4. This tie was necessary because the voltage from rail to water was +4 volts, from cable sheath to water +8 volts and rail to cable sheath —4 volts. By making the tie, the cable sheaths and water main were brought to the same potential and the voltage from rail to cable sheath changed from a —4 volts to a +4 volts. Voltage tests from rail to cable sheath and from rail to water were made for the entire length of the duct line and the results obtained were plotted. These are shown partially in Fig. 2. The curve indicates that wherever the current had been leaving the cable sheath for the rail, it has been reversed so as to flow

from the rail to the cable sheath. Also the flow of current was from the water to cable sheath, thus indicating that the cable sheaths no longer would be subjected to electrolysis.

When the tie was made between the 4/0 cable to which all the cable sheaths were bonded and the water main, a flow of 120 amp. to the latter was indicated. With the 4/0 cable, two lead sheaths of 9/64 in. thickness and one lead sheath of 3/32 in. thickness it is believed that sufficient current-carrying capacity is provided for the return of whatever stray currents there may be.

It is the intention of the street railway company to increase the drainage from San Jose and Ocean Avenues, see Fig. 4, to their Geneva Street substation in order to provide a low-resistance return path to the station.

Summary

The two 11-kv. cables probably have had their lead sheaths damaged somewhat due to the electrolysis in the section described heretofore, but not sufficiently to go through their 9/64-in. sheaths. These cables to date have operated without failure.

It is believed that with the remedy applied as outlined and from the voltage results obtained that no further trouble will be experienced from electrolysis in this locality.

Hydraulic Power Committee Report*

Resume of Important Subjects

By WALTER DREYER

The program of the hydraulic power committee as selected at the Fresno meeting in March, 1925, included at least one subject in each of the various parts which, when combined, make up the modern hydroelectric development. Listing these subjects and parts of the development in the order in which they occur as the water flows downstream we first have the reservoir, where the study involved is Evaporation Losses from Reservoirs. Next in order were two studies on the subject "Prevention of Silt Deposits in Conduits and Restriction in Flow Due to Animal and Vegetable Growth in Conduits. At the lower end of the development several subjects were studied; namely, Discussion of Penstock Design, Effect of Speed Regulation and Water Hammer on the Design of Relief Valves, Penstock and Surge Tanks, Vibration in Hydraulic Machinery, and Mechanical Reliability of Hydroelectric Plants.

Evaporation Losses from Reservoirs

This study is a thesis undertaken by N. W. Cummings of the California Institute of Technology, with financial assistance from the P.C.E.A. The main conception underlying the study is that evaporation is controlled by the energy which becomes available for that purpose. An instrument termed the pyranometer, which measures solar energy, was purchased by the association for the use of Mr. Cummings.

Energy is supplied to a water body by the sun and is discharged by evaporation and back-radiation. Furthermore, the air over the water may either contribute heat or carry it away according to the direction of the temperature difference. Also, since the heat capacity of a water body is large great quantities of heat may be absorbed thus decreasing for a time the amount available for evaporation. Or the water may cool, and thus increase the heat available for evaporation while the cooling is going on.

The various processes by which heat may be acquired or disposed of are: (a) Radiation from the sun; (b) Evaporation; (c) Back radiation to the sky; (d) Convection and conduction to the air; (e) Storage in the water body itself.

It should be noted that (a) always is a source, (b) and (c) always are sinks except on those rare occasions when the water-surface is below the dew-point and condensation occurs; while (d) and (e) may be either sources or sinks.

Reflection is not counted because we are thinking only of the energy which actually gets into the water. Any heat carried to or from the water body by inflowing or outflowing water is neglected in this discussion.

If we have two bodies of water both exposed to the same sky conditions and both thermally insulated then (a), radiation from the sun, will be the same for both and (c), back-radiation to the sky, will be the same except for difference of temperature. It can be shown easily that the back radiation increases by about ½ calorie per hour per square centimeter for every degree increase of temperature. It is easy to take account of (e), the stored heat in the water body itself, by measuring subsurface temperatures. The only really troublesome thing then, that is involved in a comparison of the behavior of two water bodies is (d), the exchange of heat between water and air. Fortunately this part of the problem has been solved from the theoretical standpoint and experimental tests verifying the theoretical conclusion have been made. The ratio between the heat lost or gained by conduction and convection to or from the air and that lost or gained by evaporation or condensation is given by the following equation:

$$R = 0.46 \frac{t_a - t_s}{P_e - P_s} \times \frac{B}{760}$$

when t_a and t_s are the temperatures of air and water, respectively, and P_e is the absolute humidity in millimeters of vapor pressure, P_s the pressure of saturated vapor at the temperature of the water surface and B is the barometric pressure.

The experimental work on this subject has not been completed at this time, but such experiments as have been made appear to conform closer to the new theory than any theories based solely on temperature, wind or humidity.

It is hoped that in the practical application of this method it will be necessary only to measure the solar radiation data with the pyranometer, and the average depth and temperature of the water at the

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beginning and end of the time interval. The latter may be changed into terms of heat energy and, if the water has heated up, this value subtracted from the solar energy gives the amount of energy available for evaporation.

Prevention of Silt Deposits in Conduits

This subject is one which seems somewhat difficult to terminate as field studies must be made in the run-off season. Some work was done in the spring of 1925 on the Bear River canal of the Pacific Gas and Electric Company but the results, as affording data from which scientific deduction could be made, were somewhat negative. It is intended to continue the study during the next year.

Restriction in Flow Due to Animal and Vegetable Growth in Conduits

This report was submitted at the Kansas City meeting of the N.E.L.A. and will be published in the convention report of the national hydraulic power committee.

The subject has been divided into the two general divisions of vegetable, and animal growths. It is to be regretted that very little practical information at present is available on either. The subject of vegetable growths, particularly algae has been, however, thoroughly treated in engineering literature from the standpoint of the sanitary engineer.

Such general information as has been thought desirable properly to outline the subject has been extracted from the papers of the American Water Works Association. These data have been supplemented by all available published data together with some experience of the operating companies in California on the practical problems of reduction of flow and methods of removal of obstructions.

An outline of the subjects covered in the report is as follows:

(a) Algae and Moss

- Types.
- Variation of growth with season.
- Methods of elimination:
 - Copper sulphate, chlorine, excess hydrate alkalinity.
 - Copper sulphate and screens.
 - Copper ions by electrolysis.
 - Covering conduits from sunlight.
- Effect on restriction of flow:
 - Tieton Canal, "n" increased from 0.013 to 0.0155.
 - Hat Creek Flume, "n" increased from 0.013 to 0.0248.
 - San Joaquin Light & Power Corporation Concrete Canal, capacity reduced to 80 per cent of normal for several months a year.

(b) Aquatic Flowering Plants

Location	Value of Kutter's "n"	
	Without Growth	With Growth
Miami and Erie Canals.....	0.036	0.047
	0.025	0.030
	0.025	0.032

(c) Insect Growth

Hellgramities (salmon fly larvae) in the Kern Three project of the Southern California Edison Company attach themselves to the walls of tunnels and pipe lines; capacity in some instances has been reduced 8 per cent. Removed only by scraping with wire brush. Prevention of growth by painting with smooth asphalt paint.

Discussion of Penstock Design and Operation

The result of this study is to be forwarded to a national subcommittee on this subject. The purpose is to bring up to date the 1923 report of the N.E.L.A. committee on penstocks, which was compiled by the Pacific Coast Section under H. L. Doolittle of the Southern California Edison Company.

The work covered in the new study is as follows:

- (1) Head and formulae used in determining thickness. Three methods for determining pressure and four formulae for determining strength. Working stresses used by various companies.
- (2) Factor of safety.
- (3) Expansion joints: New developments and applications at Big Creek, Drum, Copco No. 2, Balch, Buck's Creek and Pit Three.
- (4) Specials: Manifold at Big Creek No. 3, Manholes at Balch, Buck's Creek and Pit Three.
- (5) Air valves: New types, Coffin and Simplex. Prevention of freezing.

- (6) Standard flange details.
- (7) Reinforced concrete pipe: Rock Creek crossing of Pit Three tunnel.
- (8) Wood stave pipe: Saddles and supports for Copco No. 2 and Klamath Falls East Side Plants.
- (9) Revision of specifications for riveted pipe (time of "holding on" rivets decreased).
- (10) Painting of penstocks: Past experiences and present practice. Data on experimental coatings.
- (11) Specifications for welded, banded and seamless pipes.

Effect of Speed Regulation and Water Hammer on the Design of Relief Valves, Penstocks and Surge Tanks

This subject was selected at Fresno as the principal study for the year 1925-26. The report was forwarded to the Kansas City meeting and will be published by the N.E.L.A. as a serial report after some slight revision and possible addition of experimental data.

An outline of the work covered is shown below. The appendix on water hammer by R. S. Quick of the Pelton Water Wheel Company is considered to be particularly constructive as it enables the designer of water wheels and penstocks to obtain in a rapid manner the values of pressure rise due to closing turbine gates or penstock valves.

- (a) Speed Regulation.
 - Mathematical discussion with test data on runaway speed at Leavening Creek plant.
- (b) Effect on Design of Relief Valves.
 - For tangential wheels.
 - For reaction turbines.
- (c) Effect on Design of Penstocks.
 - Acceleration of flow and pressure drop.
 - Deceleration of flow and pressure rise.
- (d) Effect on Design of Surge Tanks.
 - Advantages of surge tank in bettering speed regulation and preventing undue pressure rise.
 - Factors affecting design of surge tanks.
 - Pressure rise when closing turbine gates.
 - Acceleration of flow, general requirements of various companies.
- (e) Appendix, Comparison and Limitation of Water Hammer Theories, by R. S. Quick, Pelton Water Wheel Company.
 - Derivation of general formula for pressure rise.
 - Approximate formulae.
 - Comparison of formulae.
 - Chart for calculating pressure rise by the general, or elastic water-column theory.

Vibration in Hydraulic Machinery

This study, made by Roy Wilkins of the Pacific Gas and Electric Company, was forwarded to the Kansas City meeting and will be published in the convention report of the national hydraulic power committee. The report divides such vibrations into three general classes which, together with their causes and effects, are listed below:

I—Periodic Vibrations (25 to 400 cycles per second).

- (a) Cause
 - 1—Pressure reaction.
 - 2—Close clearance and high specific speed.
 - 3—Runner and guide vane combinations.
- (b) Effect.
 - 1—Weakening of structures.
 - 2—Weakening of penstocks.
 - 3—Pitting (incidental in design).
 - 4—Loss of efficiency.

II—Non-Periodic Vibrations Due to Flow Conditions.

- (a) Cause.
 - 1—Draft tube surges.
 - 2—Air.
 - 3—Extreme variations in head.
- (b) Effect.
 - 1—Penstock breathing.
 - 2—Major shocks or pounding.
 - 3—Bearing troubles.

III—Vibrations Due to Mechanical Unbalance.

- (a) Cause.
 - 1—Usually caused by blocking part of runner with foreign material.

The report includes experimental data on vibrations of the first type together with a description of apparatus developed by Mr. Wilkins which permits of exploration of any part of the turbine, recording the pressure changes on a chart by means of the oscillograph.

Mechanical Reliability of Hydroelectric Plants

A nation-wide study on this subject was initiated by the eastern geographic division in 1924. The data obtained from 25 plants in the Pacific Coast section have been forwarded to the eastern subcommittee.

In addition, a summary of the operating experience in our geographic division has been made for these plants for the years 1924 and 1925, and it is intended to continue the work for at least four more years.

An analysis of each year's operation is given, for the following items:

Service time.
Idle time.
Outage time (a) in demand, (b) not in demand.
Reserve time.
Demand time.
Capacity factor.
Output factor.
Service demand availability factor.

Particular attention is given to an analysis of the causes of outages, which are broadly divided into four general groups. These groups are divided further to trace the specific cause of trouble. The classification is as shown below:

- (1) **General Hydraulic Causes.**
Ice or trash, floods, penstock or canal, headgate or intake, miscellaneous other causes.
- (2) **Water Wheels and Auxiliaries.**
Runner, turbine valve, turbine gates, guide bearings, thrust bearings, governor system, pressure regulators, draft tube lubrication system, vibration, inspection, general overhauling, miscellaneous other causes.
- (3) **Generator and Appurtenances.**
Vibration, lubrication and oil leakage, rotor or field, armature iron or winding, exciter and rheostats, ventilation system, cleaning, inspection, other causes.
- (4) **Electrical Causes Beyond Generator.**
Switches, bus, transformers, outside transmission.

The study, when finally completed, will afford specific data to be used in making comparisons between the mechanical reliability of steam and hydro plants since the prime-movers committee already has made a similar study for steam-electric units. It further will permit the making of comparisons between the several types of hydroelectric units, impulse wheels, vertical reaction turbines and horizontal reaction turbines. Closer study will trace the more frequent causes of trouble with the result that improvements in design unquestionably will be made in order to remove the causes of such outages.

Subjects Selected for Study for Year 1926-27

In line with the policy of making the work of the Technical Section continuous the subjects to be studied next year were selected by the committee at the 1926 Fresno meeting and the work already started under J. M. Gaylord, vice-chairman, of the Southern California Edison Company.

The subjects selected are as follows:

(A)—New Subjects.

- (1) Handling of stored water.
- (2) Continuous measurement of flow of water.
- (3) Operating experience with trash racks.
- (4) Pressure tunnels.
- (5) Penstock valves.

(B)—Old Subjects to Be Continued.

- (1) Continuation of study on Mechanical Reliability of Hydro Plants.
- (2) Continuation of study on Evaporation from Reservoirs.
- (3) Continuation of study on Prevention of Silt Deposits in Conduits.
- (4) Continuation of study on Water Hammer, with particular emphasis on experimental data.
- (5) Continue study on Painting of Penstocks, including data from more recent inspections.

Commercial Section Reports

Merchandising Committee Reports*

The merchandising subcommittee has studied the situation in the territory covered by the P.C.E.A. in reference to sales of appliances by dealers and power companies. After a careful analysis it feels that at this time no positive recommendations can be made for changes in the policy of any of the power companies toward merchandising; it believes that this is a matter that can best be handled by each individual company. A general summary of its findings follows:

Some Methods of Power Company Merchandising Small Appliances

The introduction of the household electrically operated refrigerator and its possibilities as load builder, has called the attention of power companies to the possibilities of increased demand for current through sales of other appliances. Many household surveys have been made in different sections of the country, resulting in a surprising lack of ownership of small appliances, particularly where such sales had been left entirely to the electrical dealers, showing that some activity on the part of the power companies was necessary to boost such sales.

Four methods of sales have been tried. The first is where the power company has widely advertised cut prices and not in any way attempted to assist dealer sales, resulting in the discouragement of dealer activities. While this method has usually resulted in large sales, it frequently led to deficits in the merchandising department, and it is doubtful if in the end the results obtained were justified, particularly if at any time the power company desired to stop mer-

chandising there was no one to actively continue the work, leaving matters worse off than at the start.

The second method was more constructive. Where the power companies advertised and sold small appliances at the regular list prices this did not interfere with dealer sales but on the contrary assisted them, as it continually called the appliances to the attention of the prospective purchaser and while some customers preferred to purchase from the power company, many others bought from the local dealer so long as he maintained the same price and guarantee. The objection to this plan was that often the dealer, in an endeavor to undersell the power company, would either cut the price or sell an inferior and less expensive first cost article, resulting in some dissatisfaction.

The third method was the most successful. Here the power company widely advertised the appliances, selling them in general at list prices, allowing dealers to purchase from them at their cost for cash, such appliances as they were advertising and selling. In this manner dealers were given the advantage of the power company's purchasing power, and prevented from cutting prices, as they refuse to sell any dealer at their cost who habitually cut the retail price. Where special prices were made, the dealer was amply protected as to margins. One company with a large number of customers notifies all with monthly bills that at the first of the following month it will sell one appliance for a special cut price and that after a certain number has been sold the regular price will be effective.

The fourth method was an intensive campaign either with or without dealer assistance. Considerable newspaper and other advertising was used; crews were put out with stock carried on auto trucks and immediate delivery of sales made. These crews called once a month as far as possible in their territories and became a regular expected caller at the homes. All appliances were sold at list. The results are reported

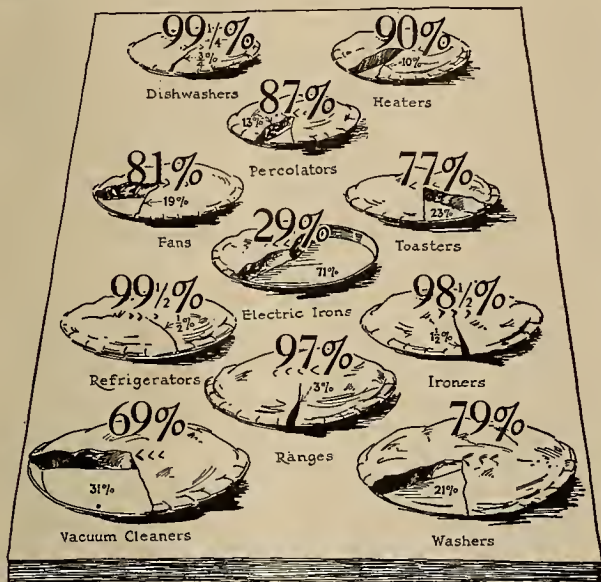
*Merchandising Committee: J. W. Wrenn, Great Western Power Company, chairman; George W. Barker, Allied Industries, vice-chairman; E. S. Alexander, Alexander & Lavenson Electric Supply Company; H. H. Courtright, Valley Electrical Supply Company; R. G. Holabird, Western Electric Company; J. C. Hobrecht, J. C. Hobrecht Company; Arthur Kempston, Majestic Electric Appliance Company; Frank Pollard, Heesman Pollard Company; R. T. Stephens, Pacific Gas and Electric Company; G. B. Schuyler, Johnson Washer Company; R. E. Tompkins, Pacific States Electric Company; C. J. E. Watson, Landers, Frary & Clark.

as satisfactory and financially profitable. This plan is still in use.

Objections to Power Company Merchandising Small Appliances

The following objections regarding central station merchandising are sometimes voiced:

1. A feeling that this is not the business of a power company but should be left to dealers, manufacturers and jobbers.
2. Difficulty of securing and training salesmen for a department with which they are not familiar.
3. Amount of money involved in carrying stock and accounts.
4. Merchandise loss in depreciated and obsolete stock.



Saturation of electrical appliances in wired homes as compiled by Electrical Merchandising. The large figures show the percentages of homes still waiting to be equipped.

5. Complaints from consumers who would ordinarily be satisfied if appliance was purchased from a dealer.
6. Tendency on part of customers to postpone payment on appliance purchased from power company.
7. Difficulty in rearranging accounting system and office force.
8. Little or no room for display or warehousing.
9. Objections by dealers who feel this should be left to them.

Recommendations for Power Companies Who Intend Merchandising Small Appliances

The committee recommends that where power companies intend merchandising small appliances that they adopt the following methods in full:

1. Purchase all supplies from local jobbers who carry stocks in quantities sufficient to secure the best prices, this in preference to trying to obtain lower figures from manufacturers and being compelled to themselves carry extra stocks which require investment with possible loss through becoming obsolete and shopworn.
2. Decide upon a definite program for the year during which the sale of one certain appliance will be particularly pushed during each month.
3. Arrange with all dealers in the territory to prominently display this appliance in their windows and show cases with price cards thereon for the first week of the month in which the appliance is to be sold.
4. Arrange with all dealers to carry a stock of the appliance and to purchase same in small quantities from the power company for cash before delivery at power company's cost.
5. Secure and carefully train sales force with the idea of public relations as well as sales in mind. Sales force should be paid regular salary and a small bonus on all sales over a stipulated amount.
6. Advertise widely in local newspapers that the articles may be secured from the power company or

your dealer for a definite stipulated price for the particular month in which the advertising appears.

7. Mail broadsides describing appliance, its use and care, so as to arrive a few days ahead of your salesman notifying customer that he will call and show appliance. This requires one special employee continuously.

8. All appliances should have a cash and time sales price; if sold on time, payments should be made collectible with regular electric bill. (Dealers may not like this at first but as long as customer is willing to pay more for time purchases which dealer cannot economically carry, he will have no objection once he understands it.)

9. Provide one or more light auto trucks to accompany sales crew on which a stock of appliances can be carried for immediate delivery, principally of the appliance whose sale is being pushed that month, but some others as well, as sales of other appliances can frequently be made and delivered at once, saving time and extra cost of later delivery.

10. Each crew and truck reports every night, turning in all orders and cash collections and receiving order on storekeeper for new supply of merchandise to replace that sold and delivered. Crew leader is responsible for any losses through shortage of stock on trucks.

11. Complete but simple accounting system must be laid out for crews to enable them to account for all orders and deliveries promptly and must include the necessary orders on the storekeeper and charge slips for billing. These can be merely extra duplicates of sales tags.

12. To prevent power company from acting as general jobbers, no merchandise is to be sold dealers except the one appliance which is being pushed for the month and that only for cash with the orders; this prevents dealer from laying in an oversupply to carry him for balance of year during which time he must purchase from his regular jobber at regular prices.

13. As far as possible preference should be given to manufacturers who put up their goods in individual cartons. This keeps surplus stock from deteriorating, which is a serious matter in any company.

14. Personnel required:

- Manager appliance sales to generally supervise.
- Clerk to mail broadsides, answer phone calls, keep track of sales, etc.
- Crew leaders to be paid salary and bonus.
- Crews of 6 men to be paid salary and bonus.
- One or more sales clerks for office sales.

15. Hold meetings of all employees before plan is put in effect and ask their co-operation in giving it publicity and assistance in carrying it out.

Recommendations Where Power Company Does Not Merchandise Small Appliances

1. Appoint one employee to devote his whole time to program.
2. Arrange with jobbers and manufacturers to carry out with assistance of their salesmen, program of one appliance a month and general exhibit of such appliance in all store windows and counters first week each month.
3. Follow plan of power companies who merchandise in adopting sale of same appliance they do for the month, in this manner making program easier for jobber and retailer.
4. Attend all meetings of dealers and keep before them the necessity of co-operation if success is to be secured.
5. Use such advertising space as available to call attention of public and assist dealers.
6. Mention monthly program in company organ and suggest employees use their influence among those they come in contact with.

To enable dealers and power companies to accurately visualize the small percentage of saturation of electric appliances and the enormous opportunities for sales, we are reproducing page 6064 of Electrical Merchandising for February, 1926, which brings forcibly to attention the fact that the sale of electric appliances as compared with their possibilities has been very small.

Appliance Merchandising from a Manufacturers's Viewpoint

By G. B. SCHUYLER

In considering such a broad subject it is necessary to determine:

A. Who is selling electrical appliances? After finding out exactly who is responsible

B. What kind of a job are they doing? If the results aren't satisfactory

C. What steps, if any, can be taken to improve the situation for all concerned? There are:

1. The central station who is interested in load and public relations.
2. The manufacturer who is interested in a greater sale of his product.
3. The jobber who is interested in volume.
4. The electrical and non-electrical outlets that are interested in immediate profits.

I will endeavor to take the subject up in this order. Proof of the statements made will be either referred to or by the data and figures shown in supporting material.

Who Is Selling Electrical Appliances?

1. In large cities where the central stations are merchandising, appliances are sold by various types of outlets in the following order:

Central stations.
Department stores.
Specialty house.
Contractor dealers.
Electrical stores.

For example, in Denver, a city where the central stations are doing a real job of selling, appliances are sold in the following proportions, as shown in a survey printed by *Electrical World* in 1924:

	Per Cent
Central stations.....	41.2
Department Stores.....	29.0
Electrical dealers.....	26.4
Hardware dealers.....	3.4

Surveys made in small Western cities, where the central stations are merchandising, published in Oct. 15, 1924, issue of the *Journal of Electricity*, show that contractor dealers actually sold more appliances than the central station. A similar survey conducted by the *Electrical World* shows the same results.

2. Compare this situation with the results in large cities where the central station is not merchandising. Here appliances are sold in the following order:

1. Specialty dealers.
2. Department stores.
3. Electrical shops.
4. House furnishing stores.
5. Hardware stores.
6. Contractor dealers.

Using San Francisco as an example, sales are in the following proportion:

	Per Cent
1. Specialty stores.....	32.4
2. Household furnishing.....	20.1
3. Department stores.....	16.0
4. Electric shops.....	13.2
5. Hardware stores.....	9.0
6. Contractor dealers.....	3.8
7. Balance of outlets.....	5.5

(Results from *Electrical World* survey, 1924.)

These figures show that where the central stations do not merchandise, the bulk of the business goes to non-electrical outlets.

San Francisco is an example. Here the electrical stores and contractor dealers are only getting 17 per cent of the volume. For further proof of this conclusion you are referred to numerous surveys printed in recent numbers of the various McGraw-Hill publications.

As California is a state in which the central stations, prior to Jan. 1, 1926, have adopted a "hands off" policy, the appliance business is going to non-electrical outlets and if they aren't doing a satisfactory job for all concerned, who is to blame? They are making their immediate profit and seem to be satisfied.

Those of us who are selling washing machines have found that the electrical contractor-dealer as a factor is fast fading out of the picture. We do not depend on him. It has repeatedly been said that the reason the central stations do not take an interest in lamp socket devices is because of respect to the electrical dealer, he still being considered a factor in the sale of appliances. The electrical contractor-dealer in general is out of the washing machine picture with the result that the non-electrical dealer is getting the business. Eighty per cent of the washing machine business in California is going to 5 non-electrical accounts. Has the "hands off" policy helped the electrical dealer in this case? It appears to the writer that the present policy will eventually drive the sale of appliances into the hands of non-electrical outlets.

Often the non-electrical dealers sell an inferior grade of small appliances which are improperly serviced with correspondingly poor results to the consumer, which does not help the electrical idea.

What Kind of a Job Is Being Done in the Appliance Field?

Take washing machines as a case at point. Nationally the number of machines is increasing. Twenty-six per cent of the wired homes of the nation have washers. If all the 612,074 washers sold in 1924 were placed in newly wired homes, 34 per cent of the new homes purchased washers—showing an increasing use in these homes of 8 per cent.

A larger number of washers and all other appliances are in use in California per 100 residential lighting customers, than any other state. With 4 per cent of the population and 8 per cent of the wired homes, California sells 10 per cent of the washing machines. Thirty-five per cent of the residential lighting customers in California use washing machines, as shown by a *Journal of Electricity* survey. With washing machine sales in the state of 61,900 in 1924, representing 32 per cent of the new residential lighting customers, California sales are falling short 3 per cent, while nationally, sales have increased 8 per cent. Since this is true regarding washers, there is probably a similar loss in other appliance sales.

I can readily realize that the central stations aren't greatly worried over the loss of that 3 per cent from strictly a load standpoint, a washer being worth only about \$2 per year to a power company. At that, the new washer connected load represents about \$123,800 to the utilities and I take it that all such items help.

But this paper isn't dealing with this problem strictly on a load basis. A washing machine should be of primary interest to a power company because:

1. In the first place it is one of the three preferred appliances of the housewife; these being the flat iron, vacuum cleaner and washing machine. This was brought out by a questionnaire sent to 5,000 housewives to which 2,600 replied. The sooner Mrs. Housewife buys these three appliances, the sooner will she get the percolator, waffle iron, toaster, etc., which builds the load that you are so anxious to get on your lines.

2. I have heard a lot about "public relations." If you sell a washer to a housewife who has been doing her own washing and relieve her of that drudgery, you will do more for your public relations in that household than all the books that have been written on the subject. Ironing, sweeping and washing are the most disagreeable jobs in the house. This is the reason for the expression of preference for the iron, sweeper and washer. The sale of these appliances will make her hardest work easier and will really make her a booster for the "electric idea."

3. There are more electric irons in use than there are wired homes. A washer in these homes insures you of the maximum revenue from the iron. An iron, where there is a washer in the home is worth more

than \$12 per year to the power company. Also the washer paves the way for quicker introduction of the electric ironing machine with its 1,000 watts of connected load, a market with only a 2 per cent saturation at present.

Granting that I have shown that

A. Non-electrical outlets are selling the bulk of appliances in California and

B. That the results obtained are not wholly satisfactory from several angles and that appliances even with low load factors are of primary importance to the power companies,

What Steps, If Any, Can Be Taken to Improve the Situation?

If you don't sell lamp socket appliances, it is to your interest to help others do so.

1. Do your own employees use a wide range of electric appliances? Have surveys been made to determine if they do? Their homes should be nearly 100 per cent electrical. Every inducement should be offered your employees to electrify their homes, including washing machines.

2. Display lamp socket appliances on the floors of your district offices. There is where the consumer should be able to go to see a display of reputable makes of appliances. They will go there if you give them half a chance. Where else should they go, a drug store? They are selling washing machines in a drug store in Tacoma. Washing machine sales in California could be brought up to a figure far above the 35 per cent mark if the central stations put more co-operation behind the dealers, jobbers and manufacturers.

3. The sales force canvassing for electric refrigerators and ranges already in the field, is a great potential sales force for irons, vacuum cleaners, washers, and other appliances. It would seem logical in canvassing for large load builders that the salesman should see how far along the house is with the electrical idea. If the housewife hasn't an iron, vacuum or washer, I think she should be sold one or all of these articles first. They certainly save more labor than a range or refrigerator. By telling her the convenience of these three important appliances and by getting her to use them, you will make a real electric booster of her and an asset to your public relations. This sales force could be a real factor in selling them. I don't know what their instructions are but we have made several unsuccessful attempts through the utilities to get their sales force to visit our factory and learn something about washing machines so they could at least answer questions intelligently and other manufacturers have probably had the same experience. This co-operation would not cost the companies anything and would help the appliance business generally.

4. Allow advertising material to be available at the district offices and feature lamp socket appliances occasionally in your newspaper copy. Personally, I can't see why advertising material should be kept out of the monthly bills if you really want appliances sold.

5. If the central stations want to sell appliances why not let them be sold out of their district offices on a concession basis as the central station is best equipped to handle the collection problem.

I believe to give any real impetus to the sale of washing machines, the power companies will have to select several makes of washers to sell or help sell. There are 120 makes, some better than others and they can't help them all. As a matter of fact, they have already done that on ranges, heaters and electric refrigerators. Requirements as to quality, distribution, price, washing ability, service, delivery, upkeep, costs, etc., could be the basis of selection. Grief in doing so, yes, but necessary to get any real volume.

The washing machine as manufactured at present represents practically no load compared with several other appliances, but is a real asset to the housewife and a stepping stone to the inception of the electrical idea. But the washing machine of the future may be a real load-building device. We conducted a survey of 1,000 users of our particular washer, which is equipped with a gas water heater, to find out their buying motive for our particular make. Thirty-seven

per cent of the replies stated that the water heater was their primary buying motive. The gas companies in other sections have sold many thousands of washers on account of this gas heater. It appeals to the housewife.

A washing machine with an electric heater of 1,000 watts to maintain the temperature or a 4,500-watt heater to heat the water in the tub is both feasible and desirable from a sales and load standpoint.

The appliances sales problem in California has taken an inevitable trend under present circumstances to the detriment of many interested factors in the appliance business. I believe the power companies can materially improve conditions and assist the electrical dealer by actively aiding the sale of lamp socket devices at regular retail prices.

Unified Merchandising

By GEORGE W. BARKER

For the first time in the history of this organization this committee, heretofore known as the "Appliance Committee," has functioned, at the request of the National Electric Light Association, as the "Merchandising Committee." For the sake of uniformity and unanimity the committee gladly adopted the new nomenclature, thereby definitely establishing the proper committee designation for the future. Although working under a new name the committee has not felt that the scope of its activities was in any way changed and has centered attention on matters pertaining to electrical appliance sales.

At a formal meeting of this committee held in San Francisco in December, 1925, the following resolution was passed: "Let it be resolved, that the sense of this meeting is that this committee should recommend for practical application a feasible plan for the constructive development of retail electrical appliance selling; that this plan, in turn, be transmitted to the chairman of the Commercial Section of the Pacific Coast Electrical Association for his consideration; that, in the event of his approval of the plan, he be requested to transmit it to the Executive Committee of the California Electrical Bureau for their consideration, with the idea in mind that, if their directors approve, this committee shall take the necessary steps to have the plan become operative."

Therefore as a part of this committee's general program to advance ideas, suggestions and methods that might be helpful in electrical appliance merchandising, a great deal of thought and attention has been given to the matter of definite and concrete selling plans. The general opinion that "there is nothing new in merchandising" does not seem to be borne out in fact. However, this committee has been more concerned with drawing anew attention to proved methods than with seeking acclaim for propounding untried ideas of possibly doubtful value. Therefore, every suggestion has had the most careful scrutiny by the practical merchandisers who compose the committee and frank discussion has been held on every phase of selling activity that has been presented. The experiences of all classes of electrical appliance retailers have been carefully reviewed and analyzed with the intent of incorporating into a general plan any good that might have been noted. From these discussions one thing has become very evident—the need of united and directed selling effort. As a result of its studies and conclusions this committee feels that the plan herewith presented and which has already been forwarded in accordance with the resolution above mentioned is worthy of more than casual attention on the part of all concerned with appliance sales.

Some time ago a plan that embraced much that was new in sales application was advanced informally by a member of the committee. For reasons not necessary to expound here the plan has never been put into effect within the territory of this association. It has, however, been presented in a trade journal and has induced much favorable comment and is now being worked out on a limited scale in the East. The committee feels that this plan points a way to greater appliance sales, that it justifies committee endorsement, and constitutes a valuable contribution to merchandising practice.

Briefly, the plan provides for unified selling; that is

to say, the featuring for sale of the same device at the same time by all retail outlets. By the term "all retail outlets" is meant all dealers who sell electrical appliances at retail, no matter what may be the general nature of their business. It is the intent of this plan to bring about a unity of thought and action with regard to appliance selling that has never before been conceived and that, in practice, has never been attempted.

It is the feeling of the committee that such a plan as this will serve to draw closely together all of the merchandising interests in electrical appliance selling activity. This should result in a better understanding of matters electrical by the non-electrical outlets, resulting in more intelligent appliance selling, and should serve to bring to the electrical outlets the merchandising practice and experience of other lines of trade. It is the feeling that such interchange will, beyond question, result in increased appliance sales. The regrettable falling off in appliance penetration—from 25 per cent in 1920 to 20 per cent in 1923—certainly gives sufficient evidence of the need of some plan that will turn the tide of diminishing sales per capita. If dealers are to maintain their just volume of appliance sales, if power companies are to continue building an appliance load that is attractive in earning power, and if manufacturers of electrical appliances are to retain their position in the field of competition with fuel heated devices, then some sort of concerted action is immediately necessary.

In formulating a plan for merchandise sales promotion, this committee has endeavored to keep away from complexities and to make its suggestions along as simple lines as circumstances warranted. It has been the committee's desire to present a definite working and workable outline applicable to the sale of all domestic appliances while at the same time taking cognizance of all such devices that are now, or that should be, of common application in the home. The plan proposed was original at the time of its initiation but has since been advanced by the National Electric Light Association. That organization, however, has not yet applied the plan on such a broad basis as is contemplated by this committee. Perhaps this is on the theory that the plan should first be tried out in part before being more extensively applied. It is not the desire or intent of this committee to detract from the work of the National Electric Light Association or of others who have made progressive moves. On the contrary, this committee wishes herewith to express its appreciation of these forward moves and to present its desires to co-operate in whatsoever movement may be found to be for the greatest good of the electrical appliance merchandising. However, conditions within the territory of the Pacific Coast Electrical Association seem to justify greater activity in appliance sales development than that proposed by the National Association plan. For that reason this committee has continued with the formulation of its plan.

Under this plan the administrative organization will schedule for an entire year the appliances to be featured and will advise all interested branches of the industry—as well as interested related industries—as to the program, or sales calendar, sufficiently in advance to permit of the fullest advantage being taken by all. It is intended for the sales calendar to cover a twelve-month period, those devices being selected for any one month that are seasonal to that month or that experience and local conditions have shown to be most readily saleable at the calendar schedule period. This, of course, means that the plan will be semi-flexible in application—as regards merchandise selected for special effort—and means, further, that full consideration has been given to all factors in the preparation of the suggested schedule.

It is intended that the administrative organization prepare proper displays and advertising material, arrange with dealers and others for the use of prepared material, assist dealers in window trimming and the preparation of newspaper advertisements and secure the co-operation of all factions interested in the promotion of electrical appliance sales. It is fortunate that there is at hand such a well-organized and well-directed machinery as that of the California Electrical Bureau. With its intimate contact with all classes and kinds of retail outlets and with its recog-

nized non-partisan position in the field it offers an ideal medium for putting into practical application the recommendations of this committee.

Inasmuch as the sales calendar will be prepared for one year in advance it will be an easy matter to disseminate information concerning the seasonal activities and it will also be easy to prepare suitable publicity well in advance of its use. This publicity need not be confined to advertising material but can as well include reading notices and other propaganda, addresses for presentation before women's organizations, civic clubs, luncheon associations and other similar bodies. The field employees of the Bureau can do excellent work in this regard.

Believing that intensive activity for a relatively short period is better than general effort for a longer time this committee has deemed it wise to formulate a program covering the first week of each month. Of course, any dealer may continue the featuring of any device for as long a time as he desires or as circumstances warrant. In the main, however, it is the committee's thought that a close following of the plan will work to the best advantage of all interested.

In formulating the following schedule due recognition has been given to all the factors of electrical appliance merchandising. Seasonal demand, climatic conditions and the psychology of buying have all been taken into consideration. The resultant sales calendar, therefore, represents in the judgment of the committee the best outline for appliance sales activity in any one year within the territory of the Pacific Coast Electrical Association. It seems desirable that as few as possible departures be made from the proposed schedule.

Electrical Appliance Sales Calendar

January—Toasters.

February—Waffle irons (extensive annual effort by one Western power company has proved this to be a splendid item for this month).

March—Vacuum cleaners (on account of the approach of the annual "spring cleaning").

April—Ranges and percolators (in anticipation of the heat of summer).

May—Refrigeration and table stoves (on account of the climatic conditions prevailing generally at this time).

June—All appliances all the month.

July—Fans and kitchen ventilators.

August—Flat irons and toasters.

September—Washers, wavers, curlers and small appliances. (The vacation period is about over and beauty appliances are in demand.)

October—Ranges, stand and table lamps. (New homes have been completed and the long nights are at hand.)

November—Electric air and water heating week.

December—All appliances all the month.

This schedule, while particularly adapted to the territory of the Pacific Coast Electrical Association, may, perhaps, well be modified to conform to any similar national movement in order to take advantage of national publicity.

It will be noted that for the months of June and December the committee schedules "all appliances all the month." On account of the June Bride movement—which was originated by the predecessor of the present California Electrical Bureau, and which has for several years been eminently successful—June is a particularly good time for electrical appliance sales. December, of course, presents the annual gift-buying season with its attendant enormous appliance sales opportunities.

The advantages of this plan are far too many to incorporate into a report such as this. Suffice it to say that manufacturers may better regulate their production, jobbers may more intelligently assemble their stocks and dealers may more efficiently handle their buying. This should result in increased turnovers for all selling outlets with corresponding favorable effect on net return, and should also produce lessened inventories. The practical application of the plan, too, establishes a continuity of thought as regards appli-

ance purchases by the consumer that is not now possible. The sales effect of concerted display of one appliance cannot but be written in increased volume. As it is now, a prospect's attention is first on one device and then on another. His thoughts have not the opportunity to focus on the desirability of any one appliance.

Co-operative advertising—where, for example, full pages are taken in the newspapers and the space divided up among several dealers—will be much more forceful and will command much greater attention than the average small space used by an individual dealer. Letter inserts, circular letters, window displays, wagon banners and all forms of advertising should feature the device scheduled at that time. The make of equipment sold does not enter at all into this phase of the plan. The big thing is to sell the idea of using the particular electrical appliance that is being advertised. It is distinctly the retailer's function to convince the prospect that the particular make of appliance he is offering for sale is superior to others.

Dealers should be brought to a realization of the fact that a large part of the good that will come to them from the plan lies in the unanimity of action. For that reason all dealers should be urged to put forth great effort, during the first week of each month, to make adequate display, both in their stores and windows, of the electrical appliance scheduled on the sales calendar for that particular period. The effect on the buying public will be, beyond doubt, such that greatly increased sales of the article displayed will result.

It is very strongly the committee's thought that matters have drifted long enough. It is now time for the entire industry to get behind some such plan as is herewith proposed and to see to it that the plan is made fully effective. In no other way can the committee see relief from the present condition of falling per capita sales.

Remarkable Growth of the Ironer Business

By J. W. FERRY

Why has only one ironer been sold to twenty washers?

According to statistics on washer and ironer sales presented in January, 1926, issue of *Electrical Merchandising*, there are 219,000 ironers and 4,363,000 washers now in use in this country.

Of the 219,000 ironers, over 55,000 of them were sold last year. This means that in one single year better than 25 per cent of the total ironers now in use were put into the homes of the American public. Why such a remarkable growth in the past year?

It is easy to visualize that some very important developments must have taken place. That is true because in the year just past ironers have been put on the market incorporating improvements in design so as to make them practical for use in the average home.

Heretofore most all ironers were large cumbersome pieces of machinery requiring a great deal of floor space and presenting themselves as a commercial proposition and not a machine designed for the home. They were so large and bulky that the basement, or a specially designed laundry room, was the only place that would accommodate them.

This feature alone probably set up the greatest resistance to the sale of ironers. Inherently, ironing as compared with washing is a clean job and the housewife wants to do it in clean and attractive surroundings, which condition does not usually exist in the laundry or basement, and she did not want to buy another appliance that would keep her in the basement any longer than necessary. After finishing her ironing she wanted to get upstairs again as soon as possible. She would much rather do the ironing in the kitchen by hand, even though it required much more time and greater physical effort. This was probably the greatest resistance to ironer sales, but there were other contributing factors. For instance, ironers were commonly known as mangles—even the word itself set up a resistance in her mind, in that it con-

veyed the thought of tearing or pulling, and they were commonly spoken of as flat work ironers and not capable of doing the more difficult pieces such as men's shirts, house dresses, children's clothes, underwear, etc.

Both of these major objections, and a great many minor ones, are now overcome with the new machines which have been placed on the market in the past two years. And the ironer manufacturers recognize the importance of re-selling the public on the ironer idea and are spending a great deal of money for advertising in national magazines and trade papers.

That the job is being well done, is shown by the figures quoted—that 25 per cent of all the ironers now in use were placed in the homes last year.

As there was such a small amount of interest displayed by the buying public, very little, if any, was displayed on the part of the appliance dealer. It is true that dealers as a rule carried an ironer on their floor, but it was looked upon as "an orphan." The dealer and his organization knew little or nothing of the business, or of the ironer he was attempting to sell, and the manufacturer with such limited sales probably did not think it worth while to spend his time and money educating the dealer.

However, this discouraging picture is entirely effaced and now the industry has had presented to it in the new ironer what promises to be one of the most profitable and biggest labor saving appliances for the home.

Everywhere you hear the new ironers talked about and discussed. The trade is becoming thoroughly alive to the possibilities, and the dealer and his organization are becoming more and more sold on the idea that before long the ironer will be just as important an item with him as the washing machine is at the present time.

Not long ago, one of the manufacturers who has been making washers and ironers for a long time, made a survey among users of both machines with the idea of finding out which appliance was considered by the housewife to be the more desirable. Ninety-five per cent of those who replied said that if one or the other had to be given up, the washer would be the first to go. In other words, the ironer was prized more highly as a time and labor saver than the washer. And mind you, these people were using the old type ironer.

In addition to building a machine that can be used in the kitchen, that's pleasing to look at, convenient to use, that will do all the ironing (instead of only part of it), the manufacturers have designed machines incorporating other noteworthy improvements, chief among which is the "full open end" which permits skirts and other tubular articles being placed over the full length of the roll. This feature adds greatly to the utility of the machine, and with very little practice the operator can iron practically everything in the average family wash.

Then there is the automatic control which eliminates the use of foot pedals, or hand levers of any kind, and makes it possible to operate the machine with no physical effort. The operator sits at the ironer and guides the pieces through.

Among washing machine manufacturers it has long been recognized that a great many machines after being sold are used only for a short period of time, then put away—forgotten about, and the work again goes out to the public laundry. No worse condition can exist because it undoes all the work that was necessary to make the sale, and one unused machine discourages the sale of many more. This condition is becoming quite prevalent and is due entirely to the fact that in selling the washer alone the hardest part of the job—the ironing—was left to the housewife to be done by hand, and as a consequence the value of the washing machine in thousands of homes was being discounted every week. Now an ironer in those homes will put the washer in use again and instead of a disinterested washer user, the dealer will have an enthusiastic booster for both.

The size of the market for ironer sales was pointed out in the second paragraph, and it is fundamental that the biggest majority of ironers will be sold in homes where washers are used. That is logical, because the idea of doing the laundry at home by ma-

chine has been thoroughly sold, and the woman who has been educated that far is easy to interest in the proposition that she should have an ironer to complete the laundry job.

It is not hard for the dealer to visualize his local market. He knows how many washing machines are in use in his community and he knows where a great many of them are. If he will direct his ironer selling propaganda into that channel his efforts are bound to meet with immediate response, and his reward will be measured by the amount of effort he puts behind it.

Then there is still another market, although not as lucrative, nevertheless important, and that is the customers of the "wet wash" and "rough dry" laundries. Principally in the larger cities the wet wash and rough dry laundries have grown to institutions of immense proportions. Thousands and thousands of people patronize them. The work is returned to the home unironed and the housewife does it by hand. In selling this class the dealer will have the co-operation of the laundries, as it is a protection to their business to have an easier way to do the ironing at home and insuring the continuance of the housewife's patronage.

It is generally known that the wet wash laundry will wash a bundle for 85 cents that would cost \$3.40 in a finished laundry. In other words, the cost of washing is only $\frac{1}{4}$ the cost of the complete job. The housewife who patronizes the wet wash recognizes the large saving by doing the expensive part of the job at home, and a person of such an economical turn of mind can easily be made to see the wisdom of investing for a short time the money she saves, in an ironer.

The job of selling ironers has been found not to be as difficult as was generally supposed, but a definite plan is necessary, and just as hard work and well-directed effort is essential as on any of the other major appliances. It is easier than washing machine selling was ten years ago, because the washing machine man has laid the ground work.

As pointed out before, the dealer should recognize the fact that primarily his market will be among washing machine users, and first of all many of those people whom he sold himself; he has entree there and will find his own customers most easy to approach.

The first step in ironing machine selling is to get the ironer into the home and the most effective way to do that is by personal call, and the call should be made with an ironer on the truck and ready to demonstrate. Ironers placed in the home in this manner will stand more "high pressure" selling than most other appliances. Demonstrations can be "forced" because the possibility of a "pull" is not as great as in other appliances, and even though it is not sold, the ironer can be cleaned and polished, and paint scratches touched up and put back in stock and sold as new. From the dealer's standpoint, this ease of reconditioning is important, because as compared with the washing machine it is not necessary to reduce the price \$10 or \$15 and sell it as a demonstrator.

After permission has been secured for the demonstration the salesman should go through with the entire program even to the close; some dealers have one person secure the demonstration and another one try for the "close." In actual practice we have found that better results are secured when the housewife deals only with one "personality."

The first step in the demonstration is to thoroughly acquaint the prospective purchaser with the operation of the ironer. Then the salesman should seat himself, iron a few pieces of flat work such as a pillow slip, towel and bed sheet. Run these through, calling the housewife's attention to the ease and simplicity of the operation; then ask for a napkin—iron it carefully—do not fold it, but call attention to its straight edges. Then hand it to the prospective purchaser so that she may observe the high quality, luster and finish. Next ask for a tablecloth. Permit the cloth to advance over the roll 10 or 18 in., then ask the customer to take hold of the two outer edges of the cloth, and the moment she does, the salesman should step to the left and push the chair forward so that the housewife may be seated. From here on it is the salesman's duty to wait upon her—handing her one

piece after another and instructing and aiding her in the correct handling of each piece to be ironed.

By this method the prospective purchaser is educated and it does away with the old practice of a professional demonstrator doing the entire job. It has been found that more ironers can be sold by this method and at less expense, as the prospective purchaser actually does the work herself and is convinced that after a little practice she will become capable of ironing everything in her laundry.

Dealers can depend on the ironer manufacturer to give them a great deal of help and assistance if they will get in touch with the manufacturer whose ironer they are selling. Every one of them is anxious to help and the dealer should not hesitate to take advantage of every bit of assistance offered because now is the time when the dealer should get behind this appliance which in another two or three years is about to be as popular and as big a seller as the washing machine has been for the past five years.

Deferred Payment Merchandising

By P. H. BOOTH

In the problem of marketing merchandise there seems to be no question but what the system of manufacturing and distributing commodities which prevailed up to a few years ago is undergoing a decided change. As is customary when all changes occur in the generally established fundamentals of manufacturing and distributing commodities, these changes are often overdone, but eventually the pendulum swings back and a normal improved condition prevails. This, in reality, is what we are going through today in the general business of manufacturing and distributing merchandise.

The changes which have been incorporated into the former methods of manufacturing and distribution are what is known as the deferred payments system, which is another progressive method of distribution. Some choose to call it the "mortgaging income system." It is an old plan for pianos and sewing machines, but it is new to general business, largely because of the use of a third party incorporated between manufacturer and distributor in the function of finance companies. These finance companies take the paper from the dealer and perform the banking portion of the financial transaction. It makes an easy matter for the dealer to finance deferred payments of his customers, and it has worked so smoothly and so effectively and the incomes of producers have been mortgaged for six, nine, twelve and eighteen months in the future to such an extent that it has increased business considerably during the past few years over the increase which we would normally have had under the old system of so-called "cash and carry" or terms of half cash, balance in thirty to sixty days.

This new standard of manufacturing and distributing merchandise is expanding at a rapid pace, and accordingly brings up many arrangements pro and con by the "calamity howlers" and the optimists, and even by the conservatives and the progressives, so that there is a great deal of serious consideration being applied to this new question of deferred payments in marketing merchandise.

Advantages of Deferred Payment Plan

There seems to be no question but what this deferred payment system has many advantages, and its disadvantages overcome its objectionable features so far as we can judge by experience to date. One of the particular advantages is that it makes it possible for the American standard of living to be elevated much higher than it could possibly be without the deferred payment system. You can now buy clothes and many other commodities used at home, with the possible exception of groceries and drugs, gas and electricity, or commodities that are immediately consumed when purchased, with the result that the purchasing power of the average home is thereby extended to other devices which the homes of the country have not previously been able to buy. For instance, by being able to buy a pair of shoes or a suit of clothes and not have to pay cash, but only 25 per cent down, it is possible to use that additional cash to spread out over the purchase of a radio, a

range, washing machine, ironer, more and better clothes, furniture, vacuum cleaner, art works, etc., many of which would not be in the homes today if it were not for the deferred payment system of marketing.

It is true that the service rendered the consumer by this deferred payment plan naturally costs the consumer money, because no service rendered can possibly be rendered without cost, but the consumer elects to pay this additional cost in order to increase his purchasing power. It is just as though a business firm uses a bank for loans and pays for the privilege. In like manner a consumer uses a finance company for loans and pays for the privilege.

Another advantage which this principle of deferred payments gives is the fact that sellers must have confidence in the goods they sell if they are to give extended payments to the consumer, even though these extended payments are handled by finance companies, as the dealer has the responsibility eventually to the finance company for the money and to the consumer for the merchandise. The result is that merchandise sold on extended payments is higher grade merchandise than the consumer would purchase by the old standard.

Another decided advantage from the consumer's angle is the fact that deferred payments teach thrift. The American public is intrinsically honest, and they respect their obligations most seriously and most deliberately. When they obligate themselves to carry out a deferred payment contract the percentage of returned goods or defaulted contracts is comparatively small. This deferred payment plan has given rise to a very popular expression in the home, "We only have one life to live, let's enjoy it," and the large increase in the automobile business during the last five years has been largely attributed to that one phrase, and that one phrase, coupled with the easy payment, or deferred payment system, has unquestionably increased the pleasure of living in millions of homes in the United States. It is interesting to note also that the United States is practically the only country where this system of deferred payments is in effect to any perceptible degree as an integral part of the general manufacturing and distributing schedule.

The increased buying power of the consumer, with its resultant expanded market for consumer purchases, does not mean that the consumer will buy luxuries as such in excess of the restrictions of good business. The opponents of the deferred payment system have steadfastly maintained that the money or the income possessed by individuals has been trifled away on commodities, real estate and merchandise in general, which the consumer has no logical reason for purchasing, with the result that their income is mortgaged and they are deprived of the essentials which they need in a well conducted home. As an example of this, we quote from an editorial by J. H. Tregoe, executive manager of the National Association of Credit Men, who says:

"This is my monthly installment on the car," said the woman to the accountancy department of an automobile dealer, "and this is how I obtained it." By the side of the money she laid down a pawn ticket. Some jewel had been pledged for the money to make the monthly payment.

"This is the engagement ring," thought the prospective benedict, "and it will all be paid for in a year." "Ah!" thought the seller of the ring with a chuckle, "if I secure three monthly installments—and take back the ring—the transaction will have paid a profit."

These are not overdrawn incidents. They are happening all the time; and I am wondering what the economic, aside from the moral effects might be. Proponents of the installment plan of selling claim that it is not hurtful because the cost burden of the risk and the time are borne by the buyer.

If, to satisfy a need or a desire, an article is bought on installment payments covering six or twelve months, does the plan in the long run increase production? Does it not by the additional costs for the risk and time reduce ultimate consumption?

Is it not possible also—by diverting too large a share of future income to the redemption of installment obligations—to cut off the buying of normal comforts and thus to throw general business out of balance?

Production in order to assure even and stable business must have an eye to economy. There should be a control of costs that will neither affect the buying power of consumers nor make prices unattractive.

In my opinion the installment plan of selling does not lend itself at all to some commodities. The further it is indulged the more difficult will our economic problems prove to be. Merely selling goods without some idea of the consumer's ability

—without an eye to the future so as to keep distribution at least fairly even—is not a wise process. And yet such selling occurs in some lines these days.

If through the savings of eight months I can buy an article that would take me twelve months to pay for on the installment plan, then I have not been entirely wise in the purchase—unless there were very strong reasons for me to pay the additional costs and to decrease my ability to buy other things.

In reply to the above article, a reputable clothier in Los Angeles states:

Clothing is a necessity; more than that, clothes are compulsory. One must have clothing, whether one wants it or not, or whether one can afford it or not. Second: Self-preservation is the strongest instinct in man, and clothing is man's only way of protecting himself against the elements. Third: The world formulates its first opinion through the impression made by the appearance of an object. We cannot stop to investigate the qualities, good or bad; the usefulness; the desirability or the reason why of everything our eyes take in. The very idea is ridiculous. It would be more than impossible. So you see that it's mighty important for appearances to give the right impression.

People admit the importance of good clothes, yet whenever they are in tight financial conditions they are tempted to make "last year's hat," "that old suit or dress," "that old coat even if it is a little out of style," do. They haven't enough extra money to buy something new. But a "credit account" does away with this. They "can afford" to be well dressed at all times, to make a good impression, to get more out of life and to still save and get ahead.

The above is a fair example of some of the pros and cons encountered in the many discussions in every line of business, and yet this new third power in the distribution of commodities goes steadily ahead with ever-increasing expansion, and the more the deferred payment plan progresses, the more business increases and the more expansion continues. This naturally brings up the point as to how far this expansion, financed by finance companies, can go, and can the finance companies stand the test of any general business reverse which will in general curtail the income of the consumer? We have the answer to this problem in a small way in the recent anthracite coal strike, centered around Scranton, Pa., and the merchants of Scranton and the finance companies holding contracts in Scranton declared a moratorium on deferred payments for the period of the strike and immediately went on a cash basis. That was an individual case, no harm was apparently done, and the finance companies were able to handle the moratorium without serious inconvenience.

The question, however, is continually raised as to how far these finance companies can go in this continued expansion of trade, due to the deferred payment plan, before the pendulum starts to swing the other way and the reverse in general begins to accumulate. In the automobile industry, for instance, they are experiencing today a condition where the weak finance companies in the auto trade are going out of business, and the strong companies are getting stronger, indicating more than ever that the deferred payment plan is a new economic method of doing business. But we must always be confronted with the question of what is the measure of the right of the individual to buy under the American standard of living, and the judgment in the handling of this new element in business will be the judgment exercised in determining the proper limit of the individual in time payment purchases.

Experience of Electrical Industry

With this fundamental discussion of the high spots of time payment merchandising, what is the experience of our own industry in its use over a period of years for the sale of electrical merchandise? The Washington Water Power Company, Spokane, Wash., sells commodities such as an electric range and a water heater installed for \$220, with a \$10 down payment, and the balance \$10 a month with a discount of 10 per cent for cash. These deferred payments are extended to customers on their lines with whom they are in contact right along, so that their credit department has a fairly accurate picture of a customer's habits of paying and can, accordingly, exercise good judgment in passing upon orders placed under the above proposition. This is an example of the time payments which are extended in other lines of merchandise by the above company. By these sales 75 per cent of the annual sales of the company in merchandising are made and these annual sales total many hundreds of thousands of dollars over a period of years and losses have been

practically negligible. Lewis A. Lewis, the sales ment plan of selling electric ranges, and though all credit men seem to be looking forward to a collapse of our present installment method of purchasing, I cannot help but feel that our increased sales during the present prosperous times will far out-balance any losses that will be incurred should any depression come."

Another central station, the Northwestern Electric Company in Portland, has established an installment sales plan on the basis of 10 per cent down, 5 per cent per month, making the limit of their contracts work out in eighteen months, and any appliance they handle can be bought on this basis. Losses on time payments over a period of years have totalled somewhat less than 1 per cent, and defaults on conditional sales contracts not more than 2 per cent or 3 per cent per year. The cost of installation is included in the time payment on devices such as ranges and water heaters and heavy duty apparatus, although the invoice is paid by the central station to the contractor-dealer making the installation. In commenting on the question of time payments, J. C. Plankinton, sales manager, has this to say:

"I very much fear that the present trend toward extending this deferred payment plan to include jewelry, clothing, etc., is that the wage earner will be so burdened with monthly payments for luxuries, etc., that he will, in time, be unable to meet his obligations. So many people cannot refuse a salesman's solicitation as long as easy payments are offered. If the American people were required to liquidate on short notice, there would be a very great calamity resulting."

The Utah Power & Light Company in Salt Lake City has used the deferred payment plan for its merchandising for a number of years, but it requires no exact percentage as a down payment. The amount is varied to suit different sales activities, and may be as low as \$1 down to as high as 10 per cent of the purchase price. It uses the retail cash price and adds one-ninth to this amount, so that, when discounting 10 per cent for cash the net equals the retail list price, and the purchaser may even receive at any time a 10 per cent discount on the balance unpaid, by paying the amount in full. The maximum amount of time allowed is twenty-four months. Merchandise losses have been very small on deferred payment contracts. An allowance is set up in the company's cost accounting of 0.5 per cent of the gross billing to cover losses of bad accounts. This is usually in excess of the actual losses. In commenting upon this feature, P. M. Parry, commercial manager, says:

"We work largely on the theory that practically everyone is honest, and while we have to take back merchandise occasionally, it is usually resold at a price which is sufficient to cover the cost of re-handling and cover the balance due from the previous owner.

"The installation price is included in the purchase price of ranges, water heaters and heavy duty equipment wherever this is desired on the part of the customer, and the cost is distributed over the period allowed for the purchasing of the equipment. All wiring is done by outside contractors and dealers. Our idea in securing a small down payment has been largely to make it easy for the customer to secure delivery of the equipment, and thus remove as much sales resistance as possible. We feel that the down payment is not a material item, except that it shows evidence of good faith and responsibility, but as far as actual credit rating is concerned, we do not believe it makes any difference in connection with the purchase of a range or other appliance whether the consumer pays \$1 down or \$15 down. The time payment plan is, of course, an inducement for most people to buy a much more expensive and higher grade appliance than would be the case if they had to pay for same in a comparatively short time. It is my opinion that to get a proper consumer acceptance of the newer electrical appliances, especially those costing a considerable amount of money, such as ranges, water heaters, heavy duty equipment, refrigerators, etc., the time payment plan must be resorted to for the same reason that the consumer as a rule is not accustomed to paying the price required for the purchase, and the time payment plan also gives the consumer the evi-

dence of our confidence in the practicability, the utility and the lasting qualities of the merchandise that is being offered for sale."

With the Puget Sound Power & Light Company, Seattle Wash., the down payment bears no definite relation to the selling price. Ranges, washers, ironing machines, vacuum cleaners, and refrigerators are all sold on the time payment plan, subject to the approval of the credit department. The actual defaults are very small. The installation cost on ranges and water heaters is included in the price of the time contract.

With the Light Department of the City of Seattle, the regular time sales plan is on the basis of 25 per cent down and the balance in one year, but on special campaigns terms are extended for a longer period, occasionally as long as eighteen months; 5 per cent is added to the cash price for time price. Appliances which can be purchased under the time payment plan are ranges, water heaters, large air heaters, washing machines, ironing machines and vacuum cleaners. All sales are made subject to the confirmation of the records in the office, showing the customer is one of the regular consumers of current and entitled to deferred payment credit. Financial losses are less than 1/10 of 1 per cent, and less than 3 per cent default in their contracts. Installation price is included in the time contracts.

With the Idaho Power Company, the down payment is 15 per cent, 10 per cent discount for cash, and fourteen months is the length of their time contracts. Losses are 1/4 of 1 per cent. Installation price is not included in the time payment price on ranges and water heaters, as customers either pay their contractor-dealer or the central station takes over the contract and carries it over a period of months. In commenting upon this time payment plan, J. F. Orr, sales manager, states:

"If you sell good serviceable merchandise and make payments easy, your customers can make them. If the payments are too large, they cannot meet them—of course a sufficient amount must be added to the cost to take care of the carrying charges for the deferred payments."

With the Pacific Power & Light Company a down payment, except for campaigns, is 10 per cent of the contract, but on special campaigns a lower down payment has been the inducement to purchase. All appliances above \$50 list are especially priced for time payments, and a discount of 10 per cent is allowed for cash payment, but on ranges only a 5 per cent discount is allowed. The length of the time contracts is eighteen months on the larger appliances. All appliances are sold on time payments from flat irons to ranges, all subject to the approval of the credit department, or in the branch districts, the district manager approves the credit based upon the books of the company and information secured through the retail merchandise credit association. An amount of 1/2 of 1 per cent is set up as a fund to take care of losses, and this much more than covers the expense of the losses sustained. Installation cost is included in the price of ranges and water heaters, the contractor billing the company for the installation and the company adding its percentage to the amount of the cost, and putting this amount in the time payment contract of the customers.

During the year 1925 69 per cent of the company's gross business was contract business, and during 1924 the same percentage of contract sales prevailed. In commenting upon this, Vernon H. Moon, appliance sales manager, states:

"On appliances such as ranges, washers, vacuum cleaners, etc., the percentage would even run higher than 69 per cent, and, furthermore, there is no question but what so-called easy terms stimulate volume. Practically every large appliance which we sell has a life a great deal in excess of the period of the contract. This is ample protection for the seller, particularly where some attention is given to the credit risk before the sale is made, and it establishes the confidence of the purchaser in the merchandise being bought. We always make a special effort with our district managers to use particular care to see that the first few payments on a contract are collected, and if this is done, we receive a sufficient amount to

reimburse us for any possible expense or loss should the article be returned."

It is easily seen that the above figures, which in general apply to the electrical business as a whole whether conducted by retail dealers or central stations, and our investigation of the department store trade so far as it refers to electrical appliances, confirm the general estimate of down-payments, credit losses and returned merchandise because of defaulted contracts. The only exception is the question of terms, and the retail merchandise, possibly due to the restrictions of the finance companies, which usually limit contracts to ten or twelve months, whereas in the above mentioned instances, the central stations usually carry their own time payments, and the amount added to the contract covers the expense.

In this article an effort has been made to touch upon the high spots of the time payment principle in general and its application in a larger way to our electrical business in the hope that it will not only encourage time payment merchandising on an extensive and aggressive scale, but it will also encourage caution and care in the judgment that is used in handling this latest and most modern and improved addition to our economic methods of doing business.

Value of Electric Refrigeration to the Individual

By R. T. STEPHENS

Refrigeration as a means of preserving food dates back to the time of the Roman Emperors, who used mountain passes filled with snow to store the perishable supplies of their armies. Even after that, the ancients recognized that sun-dried foods also saved their lives. It was from these two ancient methods of food preservation that gradually has been developed the preservation of foods by dry cold.

Refrigeration was obtained in India at a very early date by the rapid evaporation of water, but it was not until 1755 that Dr. Cullen placed in operation the first ice machine to manufacture ice. He accomplished the feat by using the principle of the evaporation of water under vacuum. At about the same time Savoisier operated a machine by utilizing the evaporation of ether. In 1824 Vallance patented a machine operating on the evaporation system as practiced in India.

It was not until 1834 that a really successful machine was perfected, and that by a man named Perkins of London. This was rapidly followed by other systems and developments, until today we have a multitude of highly perfected machines.

The first successful machine for the home was the Frostmaker, which was made in Chicago and placed on the market about 1908. From 1908 until 1923, 30,000 homes in the United States were using electrical refrigeration. The use of these machines since then has grown by leaps and bounds, until on Jan. 1, 1926, according to the Refrigeration Committee of the N.E.L.A., approximately 70,000 domestic machines were in successful operation. Each succeeding year is bound to see electrical refrigeration grow consistently.

A practical means of food preservation, the necessity of which was recognized even by the ancients, is today within the grasp of every home owner in the United States. Today we have at our disposal and for our use a machine which might be included in a list of the seven wonders of the modern world.

A Modern Wonder

Several years ago an international questionnaire was sent to hundreds of learned men in every type of profession. In it they were to state what seven things or processes of today they would include in a list of the seven modern wonders of the world. One of the processes given a majority mention was that developed by the great Pasteur. The name given to the process is common to every tongue today for pasteurization is depended upon by the millions of people inhabiting the earth. The process is one to prevent germ growth in milk and to keep the bacteria content at a safe point to make it fit for human consumption. Such a life preserving process was named to the world as one of its seven modern wonders.

Today, along with the many other modern wonders, we do not hesitate to say that a process or a machine which preserves life and prevents disease should rightfully continue to be included in a list of present-day wonders. The modern electric refrigerator is deserving of a place and could rightfully be included as one of the seven wonders of the modern world, if for no other reason than that it is a processing machine to preserve life and guarantee continued health to its users through refrigeration.

For the purpose of going into the matter more thoroughly, however, this paper will develop the four outstanding values of electrical refrigeration to the public today. These well may be classified as follows:

First—Health.

Second—Convenience.

Third—Pride of ownership.

Fourth—Economy.

Health

First consideration will be given to the value of electrical refrigeration to one's health. Follow, if you will, the work of the great Pasteur. If no means were taken after milk were pasteurized to further prevent bacteria growth, milk would soon spoil, for it has been proved that when milk is kept at a temperature of 50 deg. or lower, the bacteria increase very slowly and there is little likelihood of harm coming from the consumption of the milk. It has also been proved, and is an accepted fact that at higher temperatures they grow at an ever increasing rate. Tests taken at the University Farm at Davis, Calif., showed the following:

Milk at 68 deg. had at the end of 24 hours, 6,000 times more bacteria than it had at the beginning; and after an additional 24 hours, had 300,000 times more.

The following is taken from the U.S. Department of Agriculture, Farmers Bulletin No. 490:

Rate of Growth of Bacteria in Milk—Relative Number of Bacteria (in multiples of original number)

Milk Held at	After 6 Hrs.	After 12 Hrs.	After 24 Hrs.	After 48 Hrs.
50 deg.	1.2	1.5	4.1	6.2
68 deg.	1.7	24.2	6128	357,499

These conditions are common to all perishable foods. Although the growth may not be as active in all cases, yet recombination and decay goes on just the same. Under 32 deg. many food products undergo a decomposition which causes them to decay slowly, since practically all such foods contain water, which upon freezing, breaks down the tissues and decay commences.

To preserve foods then, and to prevent bacteria growth, a safe range in temperatures is necessary in the box in which are stored perishable foods. This range has been determined to be between the freezing point and 50 deg. Such temperature ranges are obtainable today only by the use of the modern electrical refrigerator, the user of which is assured of a crisp dry cold which prevents germ growth, which in turn reduces the possibility of food spoilage and subsequent illness.

Added to this feature of the modern electrical refrigerator is the provision of an immaculately clean, white enamel interior in the refrigerator itself. This also insures that appetizing and healthful foods may be kept safely for it eliminates all the dirt and moisture which results from any other form of cooling. It is impossible to determine the value of such a service in dollars and cents. These safeguards to health make electrical refrigeration a hygienic necessity.

Convenience

We will pass on now to the convenience of an electrical refrigerator, which is the second feature enjoyed by the owner of such a machine. Once installed, due to the automatic devices that are a part of all successful refrigerating machines today, little or no attention is needed for its continuous operation. All the dirt and labor involved in other forms of cooling are forgotten. Beyond an occasional service call for repairs, no attention to these machines on the part of the user is necessary. Savings in labor and trouble through the use of electrical refrigeration more than justify the original investment. The monthly operation costs are soon forgotten when the electrical means

of producing a dry cold is compared to all old processes which are slowly, but surely, becoming antiquated through their crudeness of design and operation.

Take for instance the week end trip, or if one is called away from home unexpectedly on any occasion. For days at a time, regardless of weather conditions, one can remain away from home with the knowledge that upon his return he will have at his command a refrigerator full of crisp, healthful, appetizing food, which was left or prepared before his leaving.

Also one has on hand an abundant supply of ice cubes to cool refreshing beverages for oneself and guests. In sickness as well as in health cold beverages and an available supply of pure ice are necessary. Such ice is available at any moment of the day or night if one owns such a refrigerating machine.

The risk of impurities which may creep in through unclean ice, in itself justifies a person's consideration of the modern wonder. In addition to this feature there is the opportunity it provides to make frozen delicacies merely by placing liquids in the chamber used to freeze ice cubes from whence they may be used any time without fear of their being too soft for serving.

With the use of electrical refrigeration the marketing problem is reduced to a minimum, for the housewife may purchase perishable foods in quantities, insuring herself of an adequate supply for her own uses or for unexpected guests who might drop in around meal time. In this day, when automobiles are so universally used, the unexpected guest is more likely to drop in than ever before. Yet there is no need for worry or embarrassment nowadays, for the modern housewife may depend implicitly upon the mechanical refrigerator to help her out of the difficulty. When her guests depart they carry with them a remembrance that she more than did justice to the occasion.

After considering these points, in the consideration of convenience, can any electrical equipment be thought of which so satisfactorily eliminates the moment of anxiety or uncertainty, or the labor and drudgery of housekeeping as does the electrical refrigerator?

Pride of Ownership

Next we come to the third valuable feature of electrical refrigeration, that of pride of ownership. Is anyone nowadays satisfied to use the antiquated methods of transportation used by our ancestors? The thirty million automobiles in the United States alone disprove that. Likewise in almost all lines of development the same is true. We all speak more or less of "Ye Good Old Days," but who wants to go back to live them under the same conditions? And so it is the pride of ownership that makes the electrical refrigerator valuable today to its owner.

In our daily life we are bound to admire the latest and most advanced model of any device. Even though one is a car owner, the next succeeding model is the one he wants and being human and an American, he is not satisfied until he is driving it. With clothing it is the same—advanced models are always more in demand. Ask the question, "Why does such a condition exist?" And the answer is that human beings want to be up to date and have the best and most modern devices for their individual use. The desire to be associated with successful people, who readily appreciate a worthy and satisfaction-assuring piece of equipment, is also a common attribute of most civilized people today. Just as our Eastern neighbors are looking forward to the time when they can come to locate on the West coast, or at least visit the Coast, we all look forward to the possession of an electrical refrigerator.

Economy

This leads to the fourth and most vital feature of electrical refrigeration—its economy.

Today a domestic refrigeration machine can be had to suit any individual requirements. As low an initial cost as \$250, delivered to any point on the West coast, is available. The installation of such a machine today requires no more labor than that required to put it in place and connect it to an electric service outlet; to turn on the current is to commence the refrigeration process.

The matter of operation costs is also extremely in-

teresting. By referring to Electrical Merchandising for February, 1926, page 6088, one may find that the average cost per refrigerator, per year, for current is \$28.08. This is based on a consumption of 864 kw-hr. at .0325c per kw-hr. The average rates on the Pacific Coast, using figures obtained from the Journal of Electricity, are as follows:

Straight lighting schedule.....	.0525c
Combination schedule.....	.0325c

If, then, the electric refrigerator is used in conjunction with lighting service, the cost per year closely approximates \$45.36 as against \$28.08, where it is used in conjunction with an electric range, water heater or air heater. Most of the Pacific Coast territory, however, enjoys a much lower rate, and where an electric refrigerator is used in conjunction with an electric range, water heater or air heater, a rate of 2 cents per kw. is obtainable, making the annual cost for electric energy amount to \$17.28 on the average. The figures used throughout this article, however, will be .0325c, which is the average for the Pacific Coast.

Then there comes the question of depreciation. An electrical refrigerator is built for a life of twenty years, or longer. Due to its cleanliness throughout its life, calculations are all based upon that length of life. The ordinary refrigerator, requiring other means of cooling, corrodes and decays due to dampness, and its usual life very rarely extends beyond seven years.

The maintenance cost on an electrical refrigerator is greater than that on an ordinary refrigeration box, but even so the maintenance seldom exceeds \$10 per year. This fact was definitely brought out by the Committee on Electrical Refrigeration of the National Electric Light Association, at its 48th convention held in San Francisco in 1925.

Considering all these costs for the electrical refrigeration unit, we have the following figures for the year:

Interest charges of 6% on the investment of \$250.....	\$15.00
Electric current costs per annum, 864 kw-hr. at .0325c.....	28.08
Depreciation—5%—based on 20-year life.....	12.50
Maintenance per annum.....	10.00
Total cost per year.....	\$65.58
per month.....	5.46

Compare those figures, if you will, with the ordinary means of refrigeration, that is, with an ice box costing \$75. You will find the figures to be as follows:

Interest at 6% on the investment of \$75.....	\$ 4.50
Ice costs—\$3 per month for 9 months.....	27.00
Depreciation (average life of box, 7 years).....	10.71
Maintenance at \$2 per annum.....	2.00
Total cost per year.....	\$44.21
per month.....	3.68

These tables cover all costs involved in owning and operating an electric refrigerator per year, in comparison with the commonly accepted refrigerator box which uses ice as the refrigerant. For the difference between \$5.46 and \$3.68, which is the actual difference in cost between the two forms of cooling, or \$1.78 per month, one gets a service comparable to no other form of cooling process known today. He has, for the small additional sum of \$1.78 per month, a health insurance of which the owner himself, his family and guests, are beneficiaries, and he receives the assurance that he is able to maintain clean, wholesome, appetizing food, hygienically preserved. Health insurance, this is, at a cost so low that if his savings from food spoilage and waste were added along with the savings in time, labor and depreciation of other cooling devices, and these in turn were all placed each month in a strong box to be opened at the end of the year, would surprise him to find there an amount of money at the end of that year which would more than offset the entire costs of owning the electrical refrigerating system.

In view of present perfection in electrical refrigeration machines, and their value from the standpoint of health, convenience, the pride of ownership and economy, no home in the United States today can afford to be without some form of refrigeration. Yet an analysis shows that 65 per cent of all homes in the United States are maintained without means of keeping foods cool. Is a person to be satisfied to remain among the 65 per cent? Of course not. He must either invest in a refrigerator box and use ice, or, better still, have a modern electric refrigerator installed in his home.

Electric Heating and Cooking Committee Reports**

Electric Range Sales During 1925 and Range Merchandising Policies*

By E. F. PERKINS

One of the major problems of the electric service company has been that of power plant development, transmission and distribution. The demand for electricity so closely pressed the supply that no great effort could be expended to influence the demand. A new era in the electrical industry is now here with the supply exceeding the demand. This new era gives the industry an opportunity to study the load curves and load factor for each particular system to the end that they can determine exactly what load should be developed in order to improve the load and operating conditions.

A study of the "Progress Report of Electric Range Survey Committee" as issued at the 1925 N.E.L.A. convention has been very enlightening to all who were skeptical regarding domestic cooking load. The completed report will undoubtedly contain further information that will be very valuable to the industry. This report shows that the electric range has a very low demand factor. The domestic electric cooking daily load curve shows three daily peaks, the first occurring between 6:30 a.m. and 8:15 p.m., the second between 11:45 a.m. and 1:00 p.m., the third between 5:00 p.m. and 6:30 p.m. The electric range maximum demand curves show that the range load is decreasing as the lighting load increases to the end that the range load is practically off when the lighting load reaches its peak.

The domestic electric cooking load is therefore a very attractive load, due to its maximum demand occurring when the industrial, commercial and lighting loads are small. The electric range will, therefore, play a very important part in the improvement of load factor.

Electric cookery has proved to the complete satisfaction of all who are using electric ranges that electricity is the ideal fuel for cooking. With the

acceptance acknowledged, Table 1 is presented which shows the ranges on the lines of the utilities, who returned our questionnaire, on Jan. 1, 1925, and Jan. 1, 1926. A comparison is also shown between 1924 and 1925 sales. A decided increase in sales is shown by most of the larger companies, some of whom increased their sales force and went out after this business in a very aggressive manner.

The Journal of Electricity has presented us with statistics showing a comparison of wired homes in Arizona, California and Nevada which is shown in Table II.

A study of Table I and Table II shows that 2.3 per cent of the wired homes in these three states are enjoying electric cookery. There was an increase of 64,108 wired homes during the year 1925. It is therefore apparent that the number of wired homes increased during the past year at a rate which is 9 times greater than the number of electric ranges installed.

Table I shows an increase in number of electric ranges in use of 37.4 per cent. A survey of quotas for 1926 indicates that the utilities are anticipating

TABLE II—WIRED HOMES

State	Wired Homes		Increase
	Jan. 1, 1926	Jan. 1, 1925	
Arizona.....	30,550	29,090	1,460
California.....	1,154,500	1,091,892	62,608
Nevada.....	13,630	13,590	40
Total.....	1,198,680	1,134,572	64,108

an increase of approximately 35 per cent with only one utility shooting at a quota in excess of this percentage. This utility is one of the largest in the territory and has planned a program which anticipates an increase of 65 per cent in electric range consumers. While there is an increase in general activity, it would appear that only one utility is taking real advantage of the opportunity offered in this field.

The facts should be rather startling to the electrical industry, who, as a whole, have taken little interest in this part of their business. The number of men whose income is from the electrical industry and who have no knowledge regarding the electric range, is also startling. The hardest prospects to sell an electric range are some of our own men. It is needless to say that everyone in the electrical industry is often asked for his opinion regarding electric cookery and it is regrettable that the advice is not based on actual experience. The electric range as we have it today is superior to every other appliance using other fuels for cooking. Is it not important that we again attempt to sell our own industry so that they can be

** P. P. Pine, San Diego Consolidated Gas & Electric Company, chairman. E. F. Perkins, Pacific Gas and Electric Company, vice-chairman. George Cole, Edison Electric Appliance Company, secretary. Committee personnel as per subcommittee lists with subsequent papers.

* Report of Electric Domestic Cooking subcommittee: M. L. Foster, Coast Counties Gas & Electric Company, chairman; P. H. Booth, Edison Electric Appliance Company; A. E. Carroll, Rutenber Electric Company; Dan Coyle, Pacific Gas and Electric Company; A. M. Frost, San Joaquin Light & Power Corporation; Philip S. George, Coast Valleys Gas & Electric Company; B. Y. Gibson, Walker & Pratt Company; Arthur Kercher; A. W. Krueger, Pacific States Electric Company; H. M. Lippert, A. J. Linderman & Hoverson Company; H. C. Rice, Southern California Edison Company; M. W. Scanlon, Westinghouse Electric & Manufacturing Company; R. A. Sharon, Great Western Power Company; G. D. Smith, Ontario Power Company.

TABLE I—RANGES SERVED BY CENTRAL STATIONS IN CALIFORNIA, ARIZONA AND NEVADA

Central Station	Ranges Installed		Percent Increase 1925	Percent Increase 1924
	Jan. 1, 1926	Jan. 1, 1925		
California Oregon Power Co.....	2,289	1,729	33	23
Central Ariz. Lt. & Power Co.....	10	6	..	0
Coast Counties Gas & Elec. Co.....	195	125	56	67
Coast Valleys Gas & Elec. Co.....	658	500	32	54
Desert Power & Water Company.....	23	15	53	37
Elko-Lamoille Power Company.....	57	45	27	..
Ely Light & Power Company.....	2	0	..	..
Flagstaff Elec. Light Co.....	20	6	332	33
Great Western Power Company.....	3,820	2,774	38	32
Los Angeles Gas & Elec. Corp.....	215	165	30	25
Nevada-California Power Company.....	1,255	987	27	0
Pacific Gas and Elec. Co.....	8,746	5,715	53	31
San Diego Cons. Gas & Elec. Co.....	897	588	52	20
San Joaquin Lt. & Power Corp.....	2,469	1,730	43	21
Southern California Edison Co.....	5,947	4,947	20	6
Southern Sierras Power Co.....	442	321	38	43
Tucson Gas & Elec. Company.....	0	0	..	0
Vallejo Elec. Lt. & Power Co.....	86	80	7	11
Western States Gas & Elec. Co.....	350	314	11	52
Totals.....	27,481	20,047	37.4	24.4

sold on their own appliances? It is needless to say that every electric range sold is a benefit not only to the buyer but to the whole electrical industry.

Consider that the utilities have thousands of miles of distribution lines in residential territory which are only in actual use a few hours in the evening of each day and that the electric range will increase the consumption per residence at least 5 times what it has been. Consider also that the electric range in itself will require practically no additional generation capacity because of its maximum use being during the hours of the day when most other loads are at a minimum. Does this not appear to be the ideal load then to develop?

The problem the industry is now facing is strictly a merchandising one. At the present rate of growth this develops into a major one. At the present time with the many utilities having different sales policies in adjacent territories, there is often confusion in the minds of the general public, especially when the range price differs by 25 per cent or so in nearby cities. This condition can not be termed a healthy one. This report will therefore deal with merchandise policies with an attempt to arrive at the general tendency in the over-all policy.

In analyzing the problems of utility merchandising policies we have several details which go to make up the whole. These details can be classified and will be discussed in the following order:

- A. Who should sell electric ranges?
- B. What should be the retail price?
- C. Should the utilities job electric ranges?
- D. Installation.
- E. Compensation of salesmen.
- F. Special sales activity.
- G. Quotas.
- H. Advertising.
- I. Servicing.

Who Should Sell Electric Ranges?

The more firms and individuals who are pushing electric range sales the more electric ranges will be sold.

The salesmen selling electric ranges are in competition with salesmen selling every other known appliance and device. It is a common statement by prospects, "I certainly would like to own an electric range, BUT we are buying an automobile, or we are going to buy this, that or the other thing." Considering the selling effort being placed behind so many devices it appears that a large and concentrated sales effort must be placed behind the electric range in order to realize on the market that exists. The lead in this movement must be taken by the utility or the prospective consumers will be buying some other merchandise on which there is a more concentrated sales effort.

A statement is often made that the business man of today enjoys every known labor saving device in his business or office. While this statement is perhaps true, we must not lose sight of the fact that the manufacturers or distributors of these appliances have been building up a high class sales organization that has, through efficient sales methods, sold these appliances. This accomplishment was not an easy one and sales effort is responsible for the results.

The problem of an old stove market is of importance inasmuch as everyone has capital invested in a cooking range of some sort. A great many people object to junking this investment until it has actually reached the junk class. It is a general practice among stove dealers to make a trade-in allowance for the old stove. It is then self-evident that unless these stove dealers are promoting the sales of electric ranges that the utilities will have strong competition until they establish an old stove market to meet the problem.

A survey shows that the furniture, hardware and kitchen equipment firms are selling by far the largest majority of cooking appliances. These firms have placed little effort behind the electric range due to the following handicaps:

1. Small demand.
2. Small margin of profit.
3. Inconvenience of installation.

These firms are then the competitors of the electric range. This natural and established outlet for ranges should be recognized and the tendency of existing policies are toward this end.

The general policy in effect today or being considered in the sale of electric ranges is a policy with the utility, contractor-dealer, furniture and hardware stores all merchandising electric ranges. The general attitude is that the utility places itself on the same basis as the other firms and sells directly the prospects which are the result of its own sales effort. The policy will insure the greatest and at the same time most economical concentration of sales effort behind the electric range.

What Should be the Retail Price?

When the electric range was first introduced in this territory the resale price was in most instances established at approximately car-load cost. It was anticipated that this policy would sell a great number of ranges in a short space of time. The fact was overlooked, however, that a demand must be established and a desire to own created before the price is even considered. The sales effort during this period was naturally limited to manufacturers and utilities and had a very high selling cost.

The next period was when the resale price was established at approximately 26 per cent above cost. This policy permitted a little activity by small dealers and permitted a small margin to off-set the selling cost.

We are now passing into the third period when the resale price will be established at list price. This policy will open the field to all dealers and permit legitimate merchandising with advertising and special effort which accompanies such merchandising. Approximately one-half the companies reporting in the recent survey are now selling at list price.

Should the Utilities Job Electric Ranges?

The tendency in this regard with the establishment of list price seems to be away from jobbing. This appears to be a natural move when we consider that manufacturers and jobbers are established in the field to accomplish this function.

Two companies have established special advertising discounts to large dealers who maintain specified displays and who do regular advertising on electric ranges. This discount is better than could be obtained from the regular channels, and is justified by the advertising received.

Installation

At the present time practically all installation work is done by the contractor-dealer. Common practice is to install electric ranges at flat prices. Some utilities limit these flat prices to company direct sales, while others will install ranges for dealers and absorb a loss up to a limited amount. It is quite necessary that means of quoting flat prices be in effect to aid salesmen.

The electrical wiring for residences has passed through two stages and is now entering the third stage, the first stage being the wiring for lights, the second the wiring in of convenience outlets. The third is the wiring specifications as covered by the "Red Seal Plan." This plan should receive the hearty co-operation of the whole industry to the end that this wiring of new homes will be accepted as a matter of fact, just as the hardwood floors and other conveniences are now accepted.

Another aid will be the establishment of a state-wide wiring code which will standardize all installations. At the present time nearly every city of any size and a great many counties have local ordinances which cause considerable confusion and at the same time increase costs. This standardization is now being studied.

Compensation of Salesmen

The common practice for compensation of salesmen is on a salary plus a commission basis. This seems to be the most satisfactory method inasmuch as it permits the salesman to control his income.

Special Sales Activity

Special sales are common practice in all merchandising to stimulate buying and move slow moving stock. Utilities should take advantage of this method of merchandising by conducting special sales off and on during the year.

These sales should have an appeal strongly advertised to draw prospects. These sales will in no way interfere with dealer merchandising as they have the same privilege.

Cooking schools followed by special sales result in increased business.

Quota

A quota serves two purposes. It shows the business anticipated during any given period of time. At the same time it shows the salesmen what is expected of them and gives them a standard by which these results are to be measured. The quota should be broken up into districts and finally down to the salesmen's territory. A great deal of enthusiasm can be created by offering quota prizes.

Advertising

Advertising plays a very important part in business of today. This advertising is divided into several classes, such as newspapers, magazine, bill boards, job signs and direct mail. There is a great need for additional advertising. It would probably be a step in the right direction to request the Advertising Committee to study this as a separate problem.

Servicing

It is a common practice for the utilities to maintain an electric service department to service electric ranges, the common practice being to take care of the manufacturer's guarantee during the first year with free labor and after the first year to charge from cost to list for repair parts with free labor. This policy seems to be working very well. In the near future we may hope that the dealer selling the range will be responsible for the service.

The main service problem of today is the matter of range service parts. With the various ranges using different elements and switches it requires a considerable investment in parts. To aid service men and to reduce the repair stock it would seem advisable that the leading manufacturers standardize on elements and switches.

Advantages of Electric Heat as a Part of the Complete Electrical Home*

Three decades ago the man who had electric lights had an electrical home. Ten years later, lamp socket appliances such as the electric iron, vacuum cleaner, and washing machine constituted an electrical home. Then the electric range was added to the necessary equipment. Today the ideal home is the completely electrified one, this modern servant being used for heating and cooking as well as for lighting and domestic appliances.

Equipment sufficient to render these services consists of 110-volt lamps and fixtures, 110-volt appliances such as toasters, waffle irons, and cleaners, range, water heater, large capacity air heaters (1,000 to 6,000 watts), an electric ironer and an electric refrigerator.

The wiring consists of a heavy 3-wire 110-220-volt main service, usually 3 No. 2 wires; 110-volt lighting circuits; 110-volt appliance outlet circuits; 3-wire 110-220-volt range circuit; 220-volt water heater circuit; and a 220-volt circuit for each heater or heating device over 660-watts capacity.

An electric home is made possible by a favorable combination of climatic conditions and of low cost of electric energy. Climatic conditions as found in California have been used in the compilation of the following figures with a combination lighting and heating rate for electricity generally scheduled by the utilities

of this state. A typical combination rate applicable to service for an eight-room house follows:

First 30 kw-hr. per month at 7c.

Next 150 kw-hr. per month at 3½c.

All over 180 kw-hr. per month at 2c.

A yearly minimum of approximately 50c per month per kilowatt of connected load, is in effect.

In an average home of eight rooms or less, 30 kw-hr. ordinarily covers the lighting, 150 kw-hr. covers the cooking, and the heating can be considered as carried on a 2c rate.

The important thing about the all electric home is the cost of operation, and it is interesting to know that many homes of from five to eight rooms use from \$200 to \$300 of electricity per year. This consumption is put on a yearly basis rather than monthly on account of the seasonal heating. The amount is divided about as follows:

Electric lighting and appliances.....	\$ 30 per year
Electric cooking.....	60 per year
Electric water heating.....	60 per year
Electric air heating.....	\$50 to 150 per year

Total yearly.....\$200 to \$300

Compare this with the ordinary home, for which purpose the following figures should be adjusted to local rates and prices:

Electric lighting and appliances.....	\$ 30 per year
Gas cooking.....	25 per year
Gas water-heating.....	50 per year
Heating (coal and wood).....	75 per year

Total yearly.....\$180

In figuring the cost of operation of a home, most people see only the fuel item, which is only one of several items and sometimes not the most important. Factors contributing to a total cost are:

1. Interest and taxes on first cost of equipment.
2. Maintenance of equipment.
3. Depreciation of equipment.
4. Labor necessary to operate.
5. Fuel or energy.
6. Health and safety.
7. General desirability.

Tangible values can be placed on the first five factors, and the cost for the use of electricity is lower than any other form of service, on all items except fuel. Intangible values in the last two items often prove the deciding feature for electricity. Balancing the low cost of the first four factors against the fuel cost, and accrediting the value of the last two factors, the electrical home is just as economical as any other, and obviously far more desirable.

Arguments for the Electric Home

The all electric home holds an especial appeal for the family in moderate circumstances, which is buying or building its own home, when the wife has a couple of kiddies to look after and is doing her own work. A servant is expensive, but a few extra dollars spent for dependable, economical electrical servants will save many hours and many steps.

Another advantage for the family in moderate circumstances, and who are building, lies in the fact that building costs can be materially reduced. By eliminating a servant's room and bath, a furnace room and flue or two, as much as \$1,800 average can be saved.

To some the electrical home represents something "better" and they are willing to pay a little more for comfort, convenience, and added pride in ownership. The first cost of building an all-electric home is usually less and after a year's operation, much to their surprise, they generally find that they have saved money.

Electricity has made of cooking a field of science in which such rapid progress has been made during the last few years that housewives have come to accept electricity for cooking as the modern, best way. It is only a question of time and opportunity until the electric range will take its place in every kitchen. Housewives have come to know that it really

* Report of the Air Heating Sub-committee: C. B. Merrick, Sandoval Sales Company, chairman; G. T. Bigelow, Southern Sierras Power Company; Frank Cronan, Western States Gas & Electric Company; O. R. Doerr, Magnavox Company; Arthur Kempston, Majestic Electric Appliance Company; E. A. Wilcox; J. W. Wrenn, Great Western Power Company.

costs nothing to operate an electric range. The savings in time, labor and food, more than pay the electric bill.

Electric Water Heating

Advantages of electric water heating and air heating are not so familiar to the public. People must be educated concerning the value of this equipment before it will be universally used.

With electricity at 2c per kw-hr., the cost of operation is the dominating factor in electric water heating and practically determines the type of equipment to be used. Intermittent heating is the cheapest method of heating water, as radiation losses are minimized and less hot water is used than where the supply is available at all times.

An external circulation type of heater banks the water at the top of the boiler where it can quickly be drawn off after the heater is started. A 5-kw. heater is the most popular on account of its speed on intermittent heating. All boilers and pipes should be thoroughly lagged, which minimizes radiation losses and tends to keep the tank hot after the heater is turned off.

Heaters should have an automatic thermostatic cut-out as insurance against heater burn-outs and fire hazard. Such a thermostat also permits turning the heater on and automatically maintaining a tank of hot water.

In the ordinary home of from five to eight rooms, it has been found that intermittent water heating takes from 150 to 250 kw-hr. per month, which, at a 2c rate, amounts to \$3 to \$5. Where the water in a tank is automatically maintained hot and a hot water service is always available, the consumption just about doubles, namely 250 to 500 kw-hr. per month, or \$5 to \$10. This is due to increase in radiation losses and in use of hot water. Service from this type is most satisfactory but in competition with gas at \$1 per thousand cu.ft., it proves more costly.

In order to lower costs, an auxiliary tank has been developed which provides a limited hot water service continuously without heating the main tank. This tank takes care of all ordinary wants, such as cooking and dish washing. When large amounts of water are required, the main tank is heated by opening a valve. This service is quite satisfactory, the consumption varying from 200 to 300 kw-hr. per month, which places it on a cost par with competitive heating.

Water heaters which are well designed and constructed are fairly free from burn-outs and require little service over a long life.

Electric Air Heating

Selling electric air heating in the home at first meets with resistance from consumers on account of their previous experience with lamp socket (660-watt) heaters. They have used these heaters on lighting rates and have failed to get sufficient heat but have received high bills.

The 660-watt radiant heater has a very definite field and when properly sold gives most satisfactory service. It is not intended to heat a room any more than a pocket flashlight is expected to light a room. Both give an intense beam over a limited area only. For spot heating, the radiant heater proves very satisfactory but for raising the temperature of any but the smallest rooms, heaters of two to six thousand watts capacity must be used.

Heat can be classified under two general headings—radiant heat and convection heat. A high temperature mass gives off radiant beams which pass through air without heating it to heat solid objects upon striking them. The rays from the sun are examples of this.

Air passing over or coming in contact with a hot mass at comparatively low temperature absorbs heat and rises and this is known as convection heating.

With radiant heat, the solid objects in the room are at a higher temperature than the air and heat it. With convection heat, the air is at a higher temperature than the solid objects and heats them by contact. It can readily be seen, therefore, that for raising the room temperature, convection heat is more effective than radiant heat.

Electric heaters are built on either of these principles, or a desirable combination of the two. A radiant convection heater dissipating the bulk of its heat by means of convection air currents but giving off a small amount of radiant heat for quick heating and coziness has proved most satisfactory.

Four features are essential in a good electric heater used for room heating in the home. (1) The proportion of radiant heat to convection heat should be properly balanced. (2) It should contain as little mass as possible in accordance with good construction. The greater the mass, the greater the amount of stored heat not immediately available for heating the air. (3) The heater should operate at a temperature sufficiently low that the dust particles in the air will not be scorched and burned, thereby soiling the walls and ceiling. (4) The heater should be so constructed as to require little maintenance and have long life.

It is customary to install a heater in each room large enough to give a comfortable temperature on the coldest winter days. There are few extremely cold days, hence for the average winter day the heater will be larger than necessary.

Heaters are all equipped with three heats so that they can be turned down to meet any condition. The large heater, when turned on full heat for a few minutes in a cold room, will rapidly raise the temperature, after which it can be turned to a lower heat.

With a difference in temperature between the outside and inside of a room, a definite heat transfer takes place from the walls, floor and ceiling, and it is necessary to supply that amount of heat to the room. In the average well constructed house, $1\frac{1}{2}$ to 2 watts per cu.ft. will produce a temperature rise of about 30 deg.

Electric heat is flexible and available in just the quantity desired at all times. One or all the rooms in a house can be heated as required. Automatic heaters will maintain even temperature, doing away with extremes of heat and cold. A hall heater will usually keep the chill off the entire house.

Portable heaters can be moved to suit the housewife's convenience or stationary heaters can be installed in the walls, where they are out of the way and take up no floor space.

One of the big advantages of electric heat is the elimination of flame and combustion with its consequent fire hazard, and the labor and dirt that goes with it. This is of considerable importance in the home with small children, where health and safety are paramount.

Electric heaters are also used with furnace installations for chilly fall and spring days when it is uneconomical and bothersome to start a furnace for just a few minutes, but uncomfortable without some heat.

In comparing electric home heat with artificial gas heat, there is one distinct advantage in the use of electricity—the elimination of sulphur dioxide gas in the air. The ruinous effect of this gas on drapes, furniture and carpets is not generally known. Many of the bleached spots on carpets, drapes and upholstery which are blamed on the sun, and many material failures blamed on poor quality, should be attributed to the action of sulphur dioxide gas.

The public knows the advantages of an all electric home and generally accepts it as better and more desirable than any other, but is dubious as to the operating cost. In this story the endeavor has been made to show that all things considered, the electric home is just as economical as others less desirable. The cost of kerosene for lighting is less than the cost of electricity, but the almost universal use of electricity for lighting where available would indicate that electric lighting is more economical than kerosene lighting when fuel, labor, maintenance and fire hazard are taken into consideration.

The public must be educated concerning the costs, other than fuel, which casual thought does not show. Then in sections of the country, where electricity is available, the electric home will predominate.

To summarize, the following question might be asked: "What does the all-electric home mean to industry?" To the contractor it means a wiring job of from \$150 to \$300, instead of \$50 to \$75 as at

present; to the dealer it means the sale of \$200 to \$500 worth of equipment which would otherwise go into other channels; to the electrical jobber and manufacturer it means additional sales of from \$200 to \$400 per home; to the power company, a revenue of from \$200 to \$300 per year, instead of \$30. Last, but not least, to the consumer it means comfort and convenience at reasonable cost.

The following questions and answers have been prepared to aid the salesman in selling the all electric home to the public.

Questions and Answers

1. Q. Cost of operation?
A. Considering cost of fuel only as against electricity, first is much less, but considering all actual costs of electric heat against other methods,
 1. Interest and taxes on first cost of equipment
 2. Maintenance of equipment
 3. Depreciation of equipment
 4. Labor necessary to operate
 5. Fuel or energy
 6. Health and safety
 7. General desirability,
 cost is quite comparable.
2. Q. Cost of Equipment?
A. For methods of heat which are comparable in performance, cost of equipment is on a parity, and when saving in building cost is considered, due to elimination of flues, furnace room, etc., first cost is in favor of electric heat.
3. Q. Are present installations operating satisfactorily?
A. Yes; the steady increase in connected load distinctly indicates this fact.
4. Q. Does number of people in room affect capacity required?
A. Yes; each person is equivalent to 150 watts, and a theatre with 1400 people seated, is equivalent to one with 210 kw. capacity installed.
5. Q. Does humidity affect the temperature at which greatest comfort is secured?
A. Yes; at 70 deg. greatest comfort is obtained with relative humidity of 36 per cent. If this is increased to 75 per cent, the temperature of greatest comfort is changed to 60 deg.
6. Q. What are the heat losses in the average living room of 12 x 20 x 9 ft. for a 30 deg. rise in temperature?
A.

.24 kw. lost through the floor.
.72 kw. lost through the ceiling
1.72 kw. lost through the walls
.65 kw. lost through the windows
.35 kw. lost through air change
3.68 kw.
.736 kw. (10 per cent lost through windage)
(10 per cent lost through intermittent ht'g)
4.416 kw.
7. Q. Interest and Taxes?
A. These items will probably be less, as they vary in direct proportion to initial cost.
Q. Maintenance?
A. Always less on properly constructed and operated equipment.
Q. Depreciation?
A. Less, because of longer life.
Q. Labor?
A. Decidedly less.
Q. Fuel?
A. More.
Q. Health and safety?
A. Paramount—as is well illustrated by the fact that the doctors are the easiest to sell on the home electrical.
Q. General desirability?
A. Clean, safe, healthful, convenient, labor-saving, instantly available, and odorless.
8. Q. For what consumers, or in what cases would you recommend electric heat?
A.
 1. All electric homes.
 2. Apartments and hotels.
 3. Churches.
 4. Schools.
 5. Theatres.
 6. Offices.
 7. Industrial applications.
9. Q. How much will a fireplace save if used in conjunction with electric heating?
A. Probably it will cost more than it saves. The draft up the chimney carries the heat with it, and with electric heating, this extra change of air is not needed for ventilation. All flues should be equipped with dampers.

Instructions for the Sale of Heavy Duty Cooking Equipment*

The progress which has been made during the last few years in the preparation of food stuffs and in the art of cooking and baking is very marked; the development has been so thorough that we are now able to procure a majority of foods which have been prepared for the market with the utmost care. Sanitation has so far entered into this work of preparation that we now find most of these articles sealed in air tight containers and packages and in many cases without having been touched by a human hand.

The care used in food preparation should not end with conditioning process and marketing of the raw material, but should continue through the whole cooking and baking system up to the final finish, thereby making it possible to procure a meal in any good restaurant or hotel cooked to your exact liking and order, and served in a dining room properly regulated by mechanical heating or cooling methods to meet extremes of climatic conditions. The dining room should be found scrupulously clean, the walls softly decorated, the light just right, the furniture comfortable, the table linen well laundered, the glassware and china clean and polished, and the service performed by efficient waiters without undue noise or confusion. In fact the whole scheme of things should be so well regulated that the setting is one which is suggestive of ease and comfort, and everything conducive to the enjoyment of a good meal, well prepared and properly served.

As food, no matter how good the quality is, may be spoiled easily by improper cooking or by poor and inefficient kitchen methods, it is evident that the greatest importance must be attached to the idea of better equipped, better lighted, more efficient and more sanitary kitchens and kitchen equipment. The old time kitchen, which for so long had furnished the material for all kinds of stories, has been forced into the discard where it so rightly belongs and in its place is now found the modern kitchen designed by specialized engineers who spare no time or pains to design and arrange kitchens which, besides being efficient and comfortable workshops for the cooks, may also be used to good advantage by the management as a show place for the guests for the purpose of advertising his culinary department.

The evolution of the kitchen to the present point of efficiency has taken about twenty-five years, and as the process of betterment is continuing at even a faster rate, it is reasonable to presume that the future will see even greater changes and improvements. As the old dish washing sink has given way to the modern motor driven dish washing machine, and meats and vegetables are now chopped or ground by power machines, as soups are strained, potatoes mashed and bread and pastry dough mixed by machines electrically operated, so will the main cooking ranges and bake ovens continue to improve in type and fuel used. Considering the great improvements that are being and will be made, it is reasonable to presume that in the not far distant future electric heavy duty cooking equipment will be as much in evidence in kitchens as the electrically operated auxiliary machines are today.

Heavy duty electric cooking in hotels and restaurants is less than ten years old; it is the youngest child of the electric industry but, like an unwelcome child, it has not only been accorded but slight recognition from many sources from which it should reasonably expect substantial support and recommendation, but it has been thrust aside and even scoffed at by the electric industry in general.

The smaller appliances such as domestic electric irons, percolators, toasters and waffle irons, also the electric range, water heater and air heater, and now the electric refrigerator, have been advertised and popularized, and the prospect's initial interest aroused

*Report of the Commercial Cooking subcommittee: W. R. Adams, Pacific Gas and Electric Company, chairman; A. J. Thornley, Southern California Edison Company; R. C. Bragg, Vallejo Electric Light & Power Company; G. W. Cole, Edison Electric Appliance Company; T. A. Reid, Westinghouse Electric & Manufacturing Company; O. F. Anderson, Great Western Power Company.

by well directed, continuous sales campaign work. Salesmen by the thousands have trudged the city streets from door to door, the rural districts have been energetically solicited, millions of dollars have been spent in special advertising, price cuts have been made (sometimes without any regard to the original cost, and the consequent merchandising loss) by the power companies, old appliances have been taken in part payment, long-term payment plans offered, and figuratively speaking "Heaven and Earth" moved in the supreme effort to train the public to do it electrically, with the result that electric labor-saving devices and kitchen ranges are no longer an object of curiosity in the average home, but are universally looked upon as positive necessities.

Unlike the domestic appliances, the heavy duty electric cooking equipment practically has had to stand alone as a rank outsider. It seems strange that this valuable load-building and revenue-making business has been aided by only a few enthusiastic, ambitious and far seeing salesmen, and that like Topsy "has just growed," virtually selling itself by its convenience, efficiency and ruggedness.

Differing from the general opinion of the catering fraternity, electric heavy duty cooking is not a wild dream of the far distant future, believed by many to be conceived by distorted minds and advocated by unbalanced enthusiasts. Heavy duty electric cooking is a realized fact, it is here with us today and, better still, it is here to stay. It is true that its advancement and growth may be seriously retarded by indifference of power companies and dealers to its many advantages and merits, and by lack of attention to its possibilities and opportunities, but the company that is wise, progressive, wide awake and alive to its own interest well can afford to provide adequate facilities for its sale, application and its increasing use in the near future. The 1,000 heavy duty ranges and 4,000 bake ovens installed and in operation in the United States today are the result of a comparatively small amount of pioneering and are the modest beginning of a great industry.

As the object of this article is primarily to stimulate the activities of those engaged in the sale of heavy duty cooking equipment and power by providing some food for thought along sales lines rather than to analyze the various articles of heavy duty electric equipment, from a mechanical standpoint, the following has suggested itself for presentation to those actively engaged in sales work.

Prospects for Heavy Duty Equipment

There are many kinds of places in which electric equipment may be used, ranging from first class to third or fourth class in each particular type. These places include:

Hotels	Industrial Cafeterias
Restaurants	Sanitariums
Cafes	Schools
Cafeterias	Hospitals
Coffee Shops	Churches
Tea Rooms	State Institutions
Sandwich Shops	Government Institutions
Boarding Houses	Private Institutions
Large Private Homes	Recreational Centers
Lodges	Clubs
Bakeries	Camps
Resorts	

The heavy duty cooking equipment which may be used is of such a variety and manufactured in so many sizes in each class, that it is very easy to decide on the article best adapted for the particular place and use, from both a convenience and an economical standpoint. Heavy duty equipment may be divided into two classes, A and B.

Class A includes the heavier and principal articles—ranges, broilers, salamanders and bake ovens. Class B includes the auxiliary articles—waffle bakers, toasters, griddles, hot plates, urn heaters, urns, water heaters, steam table heaters, dish cabinet heaters.

Interviewing a Prospect

When interviewing a prospect who is in the market for kitchen equipment for a new hotel or restaurant,

or when endeavoring to interest an owner, manager, steward or chef of an existing place in the addition of electrical heavy duty equipment to his present equipment, it will usually be found that he knows nothing at all, or very little about electricity as a fuel or electric cooking in general. He will very likely say that he contemplates using coal or oil and give as a reason for his decision "that he has used the other fuel and is well satisfied with its use," or "that his cook cannot or will not work with electric equipment," or he may state that electricity is too slow for heavy duty cooking or that his fuel bills will be too high. He will perhaps argue that the majority of places similar to his in the neighborhood are using other fuel and that he feels safe in following along the lines laid down by the majority. The excuses and arguments offered by the prospect proves conclusively that he has not been properly informed.

This is the most difficult point of the salesman's contact with the prospect, and if cleverly and tactfully handled will give him an opportunity for presenting a true and convincing statement of facts, which will be sure to arouse his interest, and pave the way for a future meeting. The salesman should convince the prospect that it is his intention and the intention of the company which he represents, whether power company or dealer, to help him in every way possible to make his particular place the best in the locality. The salesman should then ascertain the type of place the prospect intends to have, what kind of service he contemplates, the number of people he intends to serve, the number of hours he will run per day, whether the service will be continuous and whether he will use steam for stock kettles and for water heating.

Estimates of Cost

After obtaining this information the salesman should tell the prospect that he will give all the data to his company's engineer for analysis and recommendation, and that after a careful study has been made of the requirements, an estimate of the cost of operation of an electric kitchen as against a kitchen using other fuels will be submitted for comparison.

There are many methods used to make comparative estimates, but perhaps the best method is to make an estimate of the total cost of all the fuel to be used, rather than to make a comparison of operating costs of the main ranges or bake oven only. For instance, if the prospect mentions coal for the ranges, then estimate the amount of coal and the cost per month; also estimate the kw-hr. consumption of all the other (electric) equipment and the cost per month; add the two costs together and the total will be the estimated cost of coal and electricity, then estimate the kw-hr. consumption and cost of a full electric kitchen (range included). The difference between the totals will show the estimated difference between the cost of operation of a full electric kitchen and a combination coal and electric kitchen. This method of estimating will favor a full electric kitchen, particularly where a number of auxiliary articles, such as coffee urn heaters, waffle irons, toasters, hot plates, etc., are used, and where there is a sliding rate, because it will bring all of the cooking into the lower block.

The comparative estimate of costs, whether it favors electricity or the combination of the two fuels should not be given to the prospect immediately. Remember that in any transaction where hard and tedious sales work is necessary price should be the last consideration. Keep in mind the fact that the prospect, in order to insure a paying business for himself, must of necessity keep operating costs down to a minimum. Do not get impatient with him for being skeptical of electric cooking. He is entitled to his views and it is his money that he is to spend.

The salesman's big job is to sell the prospect on electric cooking. The delay gained by withholding the estimate will give the salesman the opportunity to elaborate on the advantages of electric cooking and electric cooking equipment. To successfully do this and to properly handle the deal to a satisfactory conclusion, it is absolutely essential to be able to determine the proper equipment necessary for the particular place. It is also necessary to know the equipment proposed, know it from every angle, its

construction, the material used in its manufacture, why it is constructed as it is, know how it will perform and be able to demonstrate the operation, know what results it will accomplish, the amount of work it will turn out in a given time and at what cost and how to conserve electricity and kitchen labor. It is equally important that the salesman be familiar with the equipment and operation of the equipment suggested by the prospect for other fuel, otherwise it will be impossible to correct false impressions which may be created in the mind of the prospect by other interests. It is further important that a study be made of kitchens and the various articles of kitchen equipment and their relations one to the other and the whole arrangement to the dining room.

A kitchen bears practically the same relation to the dining room that a factory bears to the sales room, each depends on the other. The requirements of the sales room to a very great measure determine the quality of the product which must be produced by the factory for sale. If the factory is inadequate by reason of poor methods, machines, or equipment the sales are bound to suffer because the required quality of the finished article cannot be offered to the buying public. So it is with the restaurant or hotel. The food must be of the best to meet the particular service and must be properly turned out of the kitchen, otherwise the dining room, no matter how well appointed or managed is bound to suffer. Therefore, the help which a power or electric salesman may be to the prospect cannot be too strongly emphasized. Enthusiasm will go a long way toward convincing the prospect, but knowledge will in all probability put over the job if strengthened with patience, sincerity, tact and honesty, for these characteristics will inspire confidence of others in himself.

Where it is found that a decided prejudice exists against electric cooking and it is apparent that the major articles of equipment cannot be installed, the salesman should endeavor to sell the idea of smaller auxiliary equipment such as waffle irons, coffee urn heaters, etc. Waffle irons perhaps offer the best means of getting an electric toe-hold in the places, as they should be easy to sell, for what is more repulsive than to see in a restaurant window a black, greasy waffle iron and what is more appetizing than to see a clean, bright, heavy duty waffle iron, operated by a neatly dressed girl. The waffles are made as easily as bread is cut for a sandwich and without the grease or smoke so much in evidence when using the older methods.

The electric bake oven is another article that has proved to be a big success and is one that has the endorsement of many of the leading bakeries and hotels through the country. It, like many of the smaller articles, has sold itself to the baker and chef by its efficiency, convenience and economical operating cost. Uniformity of baking, elimination of excessive loss due to shrinkage, ease of control, wide range of temperature between the decks of a multiple deck oven due to complete insulation are its chief recommendations.

Testimonial Letters Helpful

Testimonial letters from satisfied users of heavy duty equipment will be a big help in making sales, particularly if they refer to some place in the vicinity, as the prospect will be able to get first hand information regarding the efficiency, cleanliness, etc., of electric fuel. Photographs of the building in which the equipment is being used are also of assistance, much more so than pictures of the installation, as they give a better impression of what can be done because the prospect, when looking at a picture of a large hotel, will have to admit to himself that there must be some merit in electric equipment and electricity as a fuel if a building of the size shown in the picture can use it. The salesman should endeavor to obtain as many testimonial letters and photographs as possible and he should always have them with him when interviewing a prospect. A full list of equipment used in the place, together with a statement of kw-hr. used and electric bills covering a period of a number of months will, if tactfully handled, go a long way toward answering the arguments and objections offered by the prospect.

Special articles in trade papers and magazines devoted to hotels, restaurants, bakeries, hospitals, etc., are good mediums of sales advertising, particularly if the articles are written about some hotel in the vicinity and the story is woven around the electric kitchen or bakery. The salesman should make it his business to see that these articles get into the hands of prospect, if possible before he calls on him, as he will then be in a receptive mood and it will be much easier to hold his attention.

Prospect Lists

A sufficient number of prospects must be on hand at all times. A card should be made for every prospect developed, whether it is for new work, replacement or additional equipment. All information obtained from every source such as trade papers, newspaper items, building reports and from contact with allied trades, supply houses furnishing provisions, should be recorded on the card, together with the date it was received. The result of each contact with the prospect should also be carefully recorded, also the date of the interview. These cards should be kept in a properly indexed cabinet so that they will always be automatically brought to the salesman's notice. This will make it possible for him to concentrate on the prospects which need immediate attention.

Electric cooking will sell itself to the general public if properly advertised and there is no better way to advertise electric cooking generally than to sell the idea to the prospect of the many advantages of front end (window) cooking, flatter him if necessary by complimenting him on his foods, and give him the idea that more people would appreciate his good cooking if they could see it cooked. Sell him the idea of electric cooking by picturing the beauty, advertising value, efficiency and cleanliness of electric heavy duty equipment. Show him how his window or back counter may be converted into an art shop by a few changes, where people will have an appetite created and really forced upon them by actually seeing delicious waffles baked and the prospect will usually place the order with very little further sales effort. An attractive electric broiler or rotisserie are also articles of equipment which, if properly installed, will tend to create a desire on the patron's part and help to advertise the restaurant.

Satisfied customers are the best supporters that a salesman can have. Therefore, in order to surround himself with a number of boosters to whom he may refer prospects, he should, after an installation has been made, make occasional calls at the kitchen, get acquainted with the kitchen help and in every way possible offer helpful suggestions relative to the operation and care of the electric equipment for it is likely that the cooks have been accustomed to working on other ranges and it will require some time for them to get accustomed to the new equipment.

The range pots and pans should be inspected to make sure that they are of the proper size to fit the range top and oven, also that the bakers pans and sheets properly fit into the oven without loss of space in order that the maximum efficiency may be obtained.

Sales Arguments

The following are a few of the statements and arguments usually presented by a prospect and also some of the questions asked and the arguments and answers which a salesman may use to good advantage;

Q. How much will it cost to install an electric kitchen?

A. Tell him that you will have a specification of the equipment and the cost of the equipment ready for him in a few days.

Q. How much will it cost to operate an electric kitchen?

A. Tell him that you will go into all the particulars and will submit an approximate estimate of the cost of operation along with the specifications and equipment cost.

Q. Electricity is too slow.

A. Call his attention to the speed and efficiency of the waffle iron, cake griddle, broiler and bake oven as compared with other fuel on the same articles.

Show him how he can get a maximum efficiency from his range top by using the proper sized pots and pans.

Q. Electricity is too expensive.

A. Show him a list of equipment, number of meals served and cost of operation in some place similar to his. Show him the schedule used and work out a comparison with the local schedule in effect. Show him how he can effect a saving on foods due to the lack of shrinkage of roast meats, etc. Show him the way to conserve fuel by properly operating the switches and reducing heat in parts not in actual use.

Q. Electric equipment is too hard to operate.

A. Show him that it is just as easy to turn the switches on an electric range as it is to shovel coal into a firebox or to operate valves on an oil burner. Call his attention to the wide and positive range of temperature due to the various heat controls and the manner in which they are marked on the switches. Appeal to his intelligence by mentioning the fact that if cooks in other places can operate electric equipment successfully that a man like him would have no trouble at all.

The following are a few things that a salesman should remember when interviewing a prospect:

The prospect is being solicited to spend his money for equipment that he knows very little about. Therefore, he will have to be shown that he will be able to make a success of his business.

Remember that he has been used to seeing a fire in other equipment and is used to regulating his cooking by the size of the flame. Do not forget to sell him on electric cooking before talking price of equipment or operating costs.

Electric Water Heating*

Hot water for household use has gradually passed through various stages, from that of a luxury, to one of absolute necessity. Nothing is more essential to healthful conditions. Once continuous hot water service at reasonable cost has been enjoyed, it becomes one of the most indispensable conveniences of the modern home.

It is a well established fact that an automatic electric water heater of relatively small kilowatt capacity, connected to a well insulated boiler, will supply perfect continuous hot water service, and show better load characteristics than any other class of domestic load. In fact it seldom necessitates increasing the transformer capacity where an electric range is installed, whereas it increases the revenue from 100 to 200 per cent.

An electric water heater serves to keep the electric range sold, and to increase the revenue to the power company from it by keeping fuel-consuming devices, which otherwise might be used for part of the cooking, out of the kitchen.

Electric water heaters should be provided with thermostats in every case. If continuous automatic hot water service is not desired, then the thermostat cuts off the current in case the user neglects to turn it off. Where continuous hot water service is maintained, the thermostat cuts off the current at the proper time, thus economizing in the use of power.

No apparatus used in the home operates with less attention than the electric water heater. Fuel systems function efficiently only when regularly serviced by cleaning burners, heat absorbing surfaces, vents and flues. Methods which eliminate this expensive servicing are most desirable.

Electrically heated water systems require no burners or flues, operate over long periods of time without attention, and give off no products of combustion. No heat is lost through flues, poor combustion or inefficient heat absorption.

It is important that the system should include effective insulation against heat losses through radiation, proper storage, adequate heating capacity, and automatic temperature control.

* P. P. Pine, San Diego Consolidated Gas & Electric Company, chairman. Ontario Power Company: F. L. Allen. Truckee River Power Company: O. S. Clifford. San Diego Consolidated Gas & Electric Company: Alfred May. Sandoval Sales Company: H. E. Sandoval.

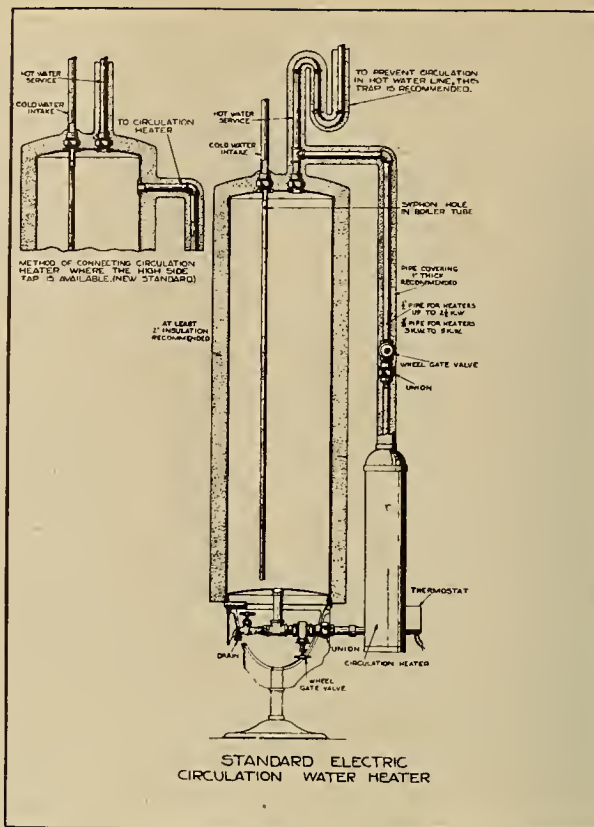


Fig. 1

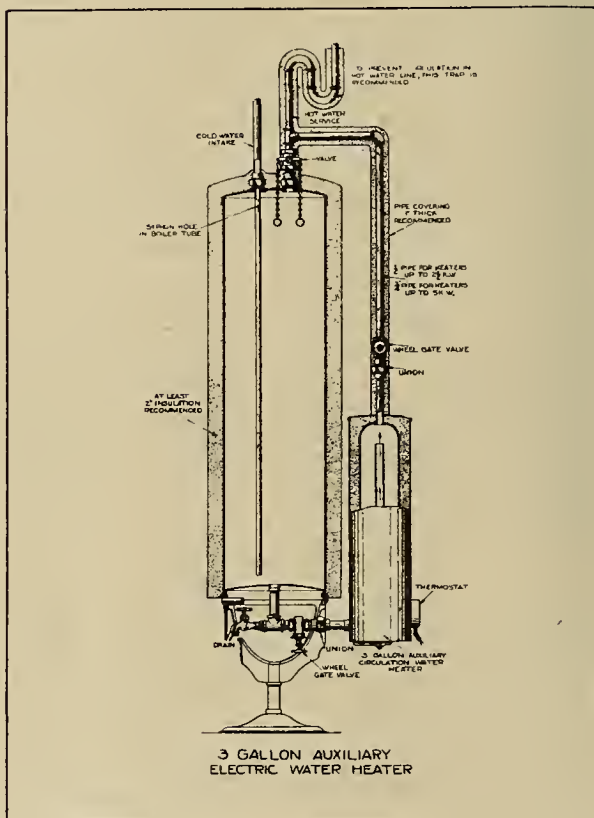


Fig. 2

Installation

The importance of proper installation of electric water heaters cannot be overemphasized. Several diagrams showing correct methods of connecting water heaters, are shown in Figs. 1, 2, 3 and 4. Many troubles will be avoided if installations are made exactly as shown. It is especially important that the pipe tee at the top of the boiler shown in Fig. 1 be

set vertically as shown, and that the bottom of the heater be mounted as low or slightly lower than the bottom of the boiler. A good rule is to connect the heater to the boiler with as few fittings as possible, using not more than two elbows, two tees, two unions, and two wheel gate valves.

The boiler should be located as near the center of the hot water distribution system as possible. The connections between the boiler and the faucets should be made by the shortest routes, likewise the connections between heater and boiler. Hot water is required at the kitchen faucet most frequently and it is desirable to have the boiler as close to it as possible.

Insulation

The present standard recommendation for boiler covering is 2-in. or more of hair felt, rock wool, magnesia or other equally efficient insulation. The pipe from the heater to the boiler should be insulated equally

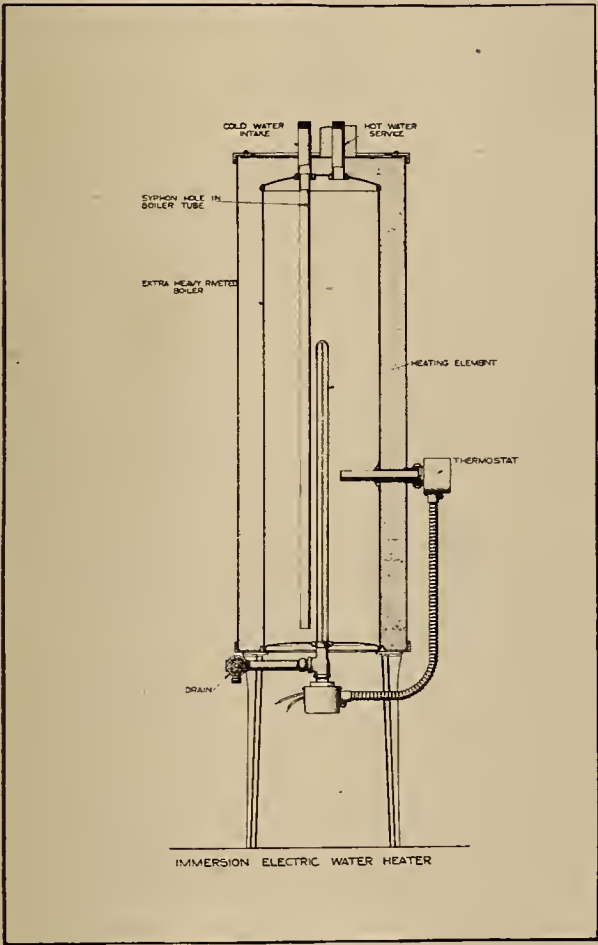


Fig. 3

as well, because bare pipe losses average from 30 to 60 kw-hr. per month, depending upon pipe sizes and temperature differences. A bare 30-gal. boiler kept hot constantly will radiate away 400 to 600 kw-hr. per month. If, however, the boiler is well insulated, the pipes between the heater and the boiler properly covered, and the heater itself well insulated, this loss usually will not amount to over 60 to 90 kw-hr. per month.

Where the hot water pipe rises vertically from the boiler, and particularly where it runs to the second floor, considerable heat loss can be avoided by inserting a "U" trap in the hot water line where it leaves the tank. (Fig. 1.) This is an inexpensive fitting, resembling the letter U, and costs no more than an ordinary pipe union.

Substantial savings can be effected by covering all the hot water pipes throughout the building. The cost is usually quite small in buildings under construction. In many completed houses the pipe to the kitchen at least can be covered without great expense.

This same care should be taken to insulate the boiler and all the hot water pipes, regardless of the type of heater, and regardless of whether or not water is to be kept constantly hot.

Thorough insulation is desirable because very often the heater is used eventually to supply continuous hot water service. If the cost is reasonable, the improved service will be appreciated so much that the user cannot do without it.

TABLE I.—Galvanized cylindrical storage tanks

Approximate Capacity Gal.	Diam. In.	Length ft.	Area Sq. Ft.	Watt Loss per deg. F. temp. diff. per hr. (Bare Surface)	Watt Loss per deg. F. temp. diff. per hr. (85% Eff. Insulation)
12	10	3	8.945	5.367	.805
18	12	3	10.995	6.597	.989
21	12	3½	12.566	7.540	1.31
24	12	4	14.137	8.482	1.272
24	14	3	13.133	7.88	1.182
27	12	4½	15.707	9.424	1.414
28	14	3½	14.966	8.98	1.347
30	12	5	17.278	10.367	1.555
32	14	4	16.798	10.078	1.512
35	13	5	18.869	11.316	1.697
36	12	6	20.420	12.252	1.838
36	14	4½	18.631	11.179	1.677
40	14	5	20.464	12.278	1.842
42	16	4	19.547	11.728	1.759
27	16	4½	21.641	12.985	1.948
48	14	6	24.477	14.477	2.172
52	16	5	23.730	14.238	2.136
53	18	4	22.384	13.430	2.015
63	16	6	27.925	16.755	2.513
66	18	5	27.096	16.258	2.439
79	18	6	31.809	19.085	2.863
82	20	5	30.543	18.326	2.749
98	20	6	35.779	21.467	3.22
100	22	5	34.079	20.447	3.067
120	22	6	39.837	23.902	3.585
120	24	5	37.699	22.619	3.393
144	24	6	43.982	26.389	3.958
168	24	7	50.265	30.159	4.524
192	24	8	56.5549	33.929	5.089

Water Heater Capacity

Most of the power companies encouraging the use of electric water heaters have established standard recommendations as to water heater capacities. These recommendations are generally based on local experience, and water heaters suitable to take care of the consumers' requirements are available.

Tables II, III and IV, which are taken from an advance copy of "Electric Heating" by E. A. Wilcox, will suggest proper heater capacities, and Table V shows the boiler capacity most often required.

Although a salesman is wholly justified in feeling that he is rendering the consumer a service by selling him an electric water heater, he should keep in mind that it is a difficult and needless task to attempt to revolutionize the consumer's habits of living against his will, particularly those of bathing.

An automatic heater that will supply intermittent hot water service will supply continuous hot water service equally as well at the consumer's will. It is often better to encourage the use of the water heater intermittently at first in order to render a service approximately the same as the consumer has been used to, until the convenience of continuous hot water and the possible economies become apparent.

Study of Table IV will serve to show why instantaneous electric water heating is usually impractical, particularly on account of load characteristics, such as demand and revenue per kilowatt of connected load.

"Most electric water heaters have their heating element completely immersed in the liquid itself, and practically all the heat generated is imparted directly to the water. Water is heated by convection currents set up within the substance itself. These convection currents are created by the difference in weight of hot and cold water. Whereas at 32 deg. F. water weighs 62.42 lb. per cu.ft. it weighs only 59.76 lb. at 212 deg. F. It is the difference in weight that causes the top of a storage tank to become hot before the bottom, and which creates the circulation in the ordinary hot water heating service."

Cost of Heating Water

Water has the highest specific heat of any known liquid or solid, or in other words requires more heat

(*From advance copy of "Electric Heating" by E. A. Wilcox.)

per unit of weight to raise its temperature than any other liquid or solid. This is, of course, true regardless of the kind of fuel used.

TABLE II.—Kilowatt capacity to heat water at 100 percent efficiency.

Quantity of Water in Gal. per hr.	Temp. Rise Deg. F	Kilowatt Capacity Required
1.....	50	.122
	100	.244
5.....	50	.611
	100	1.222
10.....	50	1.222
	100	2.444
15.....	50	1.832
	100	3.664
25.....	50	3.054
	100	6.108
50.....	50	6.108
	100	12.215
75.....	50	9.161
	100	18.323
100.....	50	12.215
	100	24.430

TABLE III.—Water heater performance at 100 percent efficiency

Kilowatt Heater Capacity	Temp. Rise Deg. F.	Gal. per hr.
1.....	50	8.187
	100	4.093
2.....	50	16.373
	100	8.187
3.....	50	24.560
	100	12.280
4.....	50	32.746
	100	16.373
5.....	50	40.933
	100	20.467
10.....	50	81.866
	100	40.933
25.....	50	204.665
	100	102.333
50.....	50	409.330
	100	204.665
100.....	50	818.660
	100	409.330

TABLE IV.—Instantaneous water heater performance at 100 percent efficiency

Heater Capacity Kilowatts.....	Gallons of water heated 100 deg. F.				
	1 min.	5 min.	15 min.	30 min.	1 hr.
1.....	.068	.341	1.023	2.047	4.093
2.....	.136	.682	2.047	4.093	8.187
3.....	.205	1.023	3.070	6.140	12.280
4.....	.273	1.364	4.093	8.187	16.373
5.....	.341	1.706	5.117	10.233	20.467
10.....	.682	3.411	10.233	20.467	40.933
25.....	1.706	8.527	25.583	51.166	102.333
50.....	3.411	17.055	51.165	102.333	204.665
100.....	6.822	34.111	102.333	204.665	409.330

TABLE V.—Sizes of boilers

Small homes.....	30 gal.
Medium sized homes, 8 rooms with 2 baths.....	40 gal.
Large homes, 10 to 12 rooms with 3 baths.....	50 gal.
Very large homes.....	60 to 100 gal.

The following tables show the specific heat of liquids and solids:

Specific Heats of Various Substances (Kent)

Liquids	
Water	1.0000
Lead (melted).....	.0402
Sulphur (melted).....	.0230
Bismuth (melted).....	.0308
Tin (melted).....	.0637
Sulphuric acid.....	.03350
Mercury .....	.0333
Alcohol (absolute).....	.07000
Fused oil.....	.0956
Benzine .....	.04500
Ether .....	.05034
Solids	
Antimony .....	.0508
Copper .....	.0951
Gold .....	.0324
Wrought iron.....	.1138
Glass .....	.1937
Cast iron.....	.1298
Lead .....	.0314
Platinum .....	.0324
Silver .....	.0570
Tin .....	.0562
Steel (soft).....	.1165
Steel (hard).....	.1175
Zinc .....	.0956
Brass .....	.0939
Ice .....	.5040
Sulphur .....	.2026
Charcoal .....	.2410
Alumina .....	.1970
Phosphorus .....	.1887

During the war the United States Government Fuel Administration pointed out that 66 per cent of all the heat used in homes in the United States was for domestic water heating. This emphasizes the fact that even fuel methods of heating water are expensive.

Where coal ranges are used with a water back to heat the boiler, they would be used only a few hours a day, if it were not for the hot water requirements. When hot water is required the ranges are kept going all day and often until 8 or 9 o'clock at night. This is a most inefficient way to heat water, although the user often thinks he is getting hot water service without additional cost.

The following tables are averages taken from the records of two of the largest power companies in California:

Small Homes

Water heated intermittently.....	125 to 200 kw-hr. per month
Three gallons kept hot constantly and main tank heated intermittently	175 to 300 kw-hr. per month
Hot water service maintained automatically	250 to 500 kw-hr. per month

Medium Sized Homes (8 rooms)

Three gallons kept hot constantly and main tank heated intermittently	200 to 350 kw-hr. per month
Hot water service maintained automatically	500 to 750 kw-hr. per month

Large Homes (10 to 12 rooms)

Hot water service maintained automatically	600 to 1,250 kw-hr. per month
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Very Large Homes with Three or More Baths

Hot water service maintained automatically	1,000 to 2,000 kw-hr. per month
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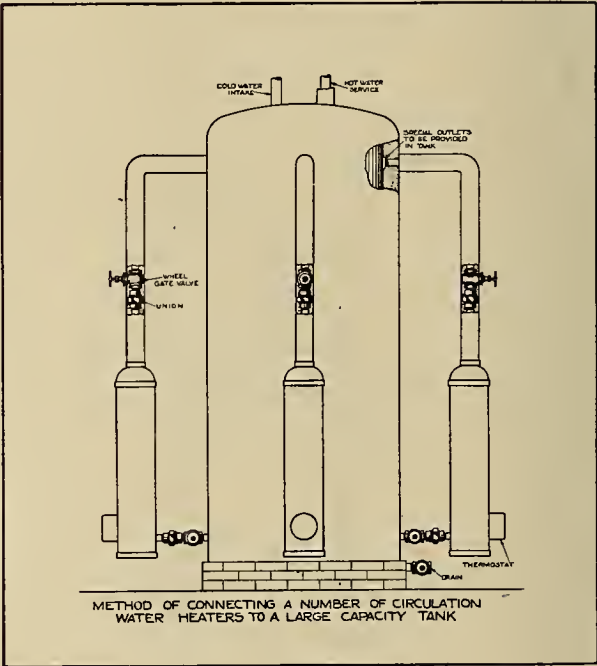


Fig. 4

Servicing Water Heaters

All standard makes of electric water heaters are guaranteed by the manufacturer for one year, when used on normal voltage, and connected properly.

Most electric heaters are built so that the heating unit can be easily removed for inspection, repair or replacement on the job and the service man usually needs to have in the worst case of trouble, only an extra heating unit or part.

In case of leaks in the shell of the water heaters or other trouble which the repair man cannot readily correct on the job, it is usually best to return the heater to the factory or service station for repairs, but this should seldom be necessary unless there is excessive pressure or the heaters are otherwise abused.

The guarantee usually provides that the manufacturer will be responsible only for repairs made in the factory, other than to supply replacement parts.

All service men should be equipped with a volt-meter and an ammeter, so that he will be able to check the voltage and the current wherever he is called on for service.

Without these instruments, it is difficult for a service man to ascertain whether or not the heater is pulling full load.

Question and Answers for Electric Water Heating Manual

1. Q. What advantages have electric water heaters over the usual fuel heaters?
- A. Electric water heaters operate silently, maintain a uniform temperature, are approved by the Underwriters' Laboratories of the National Board of Fire Underwriters, and create no fire or casualty hazards. They operate over long periods of time without attention, and are inexpensive to service or repair.
2. Q. Is a thermostat a necessary part of the water heater?
- A. The heating and cooking committees of the Pacific Coast Electrical Association have recommended thermostats in all their reports for the last four or five years. If continuous hot water service is to be maintained, the thermostat is absolutely necessary for safety and economy. If the water is to be heated intermittently, the thermostat serves to turn the heater off in case the user neglects to do so.

3. Q. Should an electric water heater be sold with each electric range?
- A. Yes, because it helps to keep the range sold, and to keep fuel consuming devices, which might otherwise be used for part of the cooking, out of the kitchen.
4. Q. Is it important to install the heaters as recommended by the manufacturer?
- A. It is extremely important in order that the heater may produce the best results.
5. Q. Should the heater and the pipes from the heater to the boiler be insulated against thermal losses?
- A. Yes. (See Insulation, page —.)
6. Q. How can I determine the amount of water that a given size unit will heat?
- A. See Table III, page —.
7. Q. What size storage tank should be used?
- A. See Table V, page —.
8. Q. What is the usual consumption in kilowatt-hour in small homes using electric water heaters?
- A. Small homes, see page —.
Medium size homes, see page—.
Large homes, see page —.

Lighting Committee Reports*

Lighting Bureau Talk Heard by Business Men in Seventeen Cities

By CLARK BAKER, SR.

The lighting bureau designed a thirty-minute talk with lighting demonstrations, which was given to 35 clubs in 17 cities, comprising the largest towns in the state of California. This talk was published in the Journal of Electricity, Feb. 15, 1926, p. 127.

In these 35 clubs a total of 3,086 people were addressed. The list of clubs represents such progressive groups as Rotary, Kiwanis, Electrical, Advertising, etc. Following is a list of towns, clubs and attendance, in tabulated form:

TABLE I.—Civic clubs addressed by Lighting Bureau

Town	Elec.	Rotary	Kiwanis	Lion	Ad.	Exchange	Misc.	Total	Total Atten.
1 San Francisco.....	1	..	1	..	..	..	1	4	466
2 Los Angeles.....	1	..	..	..	1	..	..	2	240
3 Oakland.....	1	..	1	..	1	1	1	4	608
4 San Diego.....	1	1	1	..	..	1	..	5	699
5 San Jose.....	..	1	1	..	..	..	1	2	147
6 Glendale.....	..	1	..	..	..	..	..	1	65
7 Berkeley.....	..	1	..	..	..	..	..	1	158
8 San Bernardino.....	..	1	..	..	..	..	..	1	120
9 Fresno.....	..	..	1	1	..	..	..	2	150
10 El Centro.....	..	..	..	..	..	..	1	1	33
11 Sacramento.....	..	..	..	..	1	..	..	1	24
12 Huntington Park...	..	1	..	..	..	..	..	1	64
13 Gilroy.....	..	1	..	..	..	..	..	1	35
14 Chico.....	..	1	..	..	..	..	..	1	90
15 Bakersfield.....	..	1	..	..	..	..	..	1	80
16 Santa Rosa.....	..	..	1	..	..	..	..	1	40
17 Richmond.....	..	1	..	..	..	..	..	1	67
Total.....	4	9	6	1	3	2	2	35	3086

In addition, the talk was re-written for radio and was broadcast in three "doses" over KGO, Oakland, Calif.

The committee feels the results were two-fold, commercial and good-will. Realization of the commercial value was the response of the groups approached. Many, many inquiries came to various branches of the industry for information and data directly as a result.

*Clark Baker, Sr., National Lamp Works, chairman, Southern Committee. L. A. Hobbs, Edwin F. Gnth Company, vice-chairman; Dr. Arthur E. Hoare, Los Angeles School of Optometry; G. G. Hitchcock, Pomona College; D. C. Pence, Illinois Electric Company; G. H. P. Dellman, San Diego Consolidated Gas & Electric Company; Frank von Gilluwe, C. W. Cole & Company; T. L. Nudd; W. R. Chawner, Southern Sierras Power Company, Central Committee; C. D. Monteith, Pacific Gas and Electric Company, vice-chairman; R. S. Prussia, Westinghouse Lamp Company; George Rucker, Holophane Company; M. C. Hixson, Edison Lamp Works; Louis F. Leurey; J. R. Cravath; Romaine Myers; Leo G. Gianini, Edison Lamp Works; H. H. Court-right, Valley Electrical Supply Company; C. O. Martin, Benjamin Electric Company; Victor W. Hartley, California Electrical Bureau; L. H. Townsend, Pacific States Electric Company.

Further value was evidenced by the thoughtful and intelligent questions asked at the conclusion of each meeting.

The committee does not hesitate in saying over three thousand people were started along the road of thinking better lighting.

Good-will was evidenced in the committee's opinion by editorials, among which the following appear:

"Miniature shop windows, store rooms and living rooms were shown under varying light intensities and colors illustrating graphically the need for proper knowledge and care in the design of artificial lighting for all purposes.

"This and similar talks are being given to electrical men throughout the state." * * *

"What the makers of artificial light have done with their medium is summed up in this comprehensive and yet simply stated lecture. It presents a record of achievement in illumination, and yet points to possibilities for future and more thorough application of artificial light to the various phases of human activity." * * *

Light Without Glare

"The trouble with the address last Wednesday was that the speaker hit only the high spots, gave us little glimpses of fields too much unknown, left us wanting more. Sometimes we get a grain of wheat in a bushel of chaff, a mite of result after a mountain of effort, messes of words. Here we had fullness of knowledge and ability to impart it, aptness of illustration without excess, movement systematically forward, proof through demonstration."

The committee would like to advance its belief that there was a substantial element of public relations involved in this program, meaning the talk had no direct sales purpose. Rather, it represented a service rendered by the electrical industry through the agency of the Pacific Coast Electrical Association.

We did not say—"What you need is more light;" what we did say was—"Inasmuch as you are using light, why not learn more of its fundamentals and principles, thereby securing for yourselves a maximum of service and satisfaction. Let the electrical industry assist you in this."

Recommendation

With the average lighting intensity much below standard of illumination, together with the average store needing from 40-50 per cent more illumination, it seems if even a small percentage of the three thousand business men addressed were awakened to new things, a vast field of business would be opened to the industry.

In consequence, the retiring chairman recommends for future activities serious consideration be given work similar in nature by the association.

Recent Developments in Street and Highway Lighting*

Everyone recognizes the importance of highways in the great development of the Pacific Coast. Consider what a loss it would be if the usefulness of a large percentage of highways were destroyed. Such a loss would amount to a great calamity and would check the growth and prosperity of the entire community.

On the other hand if the usefulness of these highways is materially increased we are bound to have a corresponding increase in development and pros-

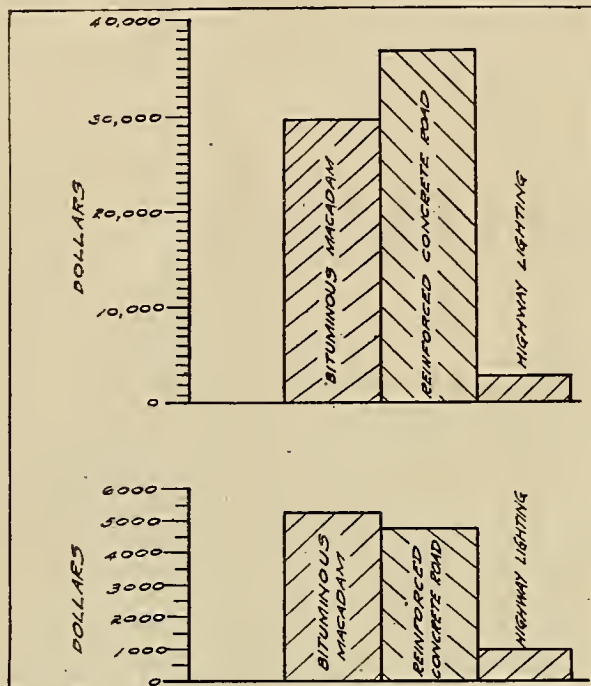


Fig. 1. Relative investment and maintenance cost per mile of highways and lighting.

perity. Today adequate highway lighting is recognized as the solution to the problem of increasing the capacity of existing highways to accommodate the tremendous increase in motor car traffic.

The problem of adequately lighting a highway at reasonable cost was solved by the development of units especially designed to meet the requirements. Such units consist of reflectors or refractors which direct all of the available light of a small lamp in two beams along the road surface. By this concentration of light along the road there is no light wasted upward or outside the highway.

Lamp Size and Spacing

With 2,500-lumen lamps spaced 300 ft. on one side only, the highway becomes a ribbon of light and driving with dimmed and even without headlights is safe. The 300-ft. spacing is preferable, but good results are possible within a range of from 250 to 400 ft. Spacing must vary, of course, to conform to existing pole spacings in many cases.

Mounting Height

Because of the concentration of light and wide spacings highway units should be mounted 30 to 35 ft. to light center. This removes any glare from concentrated light by placing it above the line of vision and permits the necessary spread for an even distribution.

Cost

The relatively small cost of lighting compared with the cost of highway construction and maintenance is shown in Fig. 1. The maintenance includes interest at 6 per cent and depreciation on the investment amounting to 10 per cent for macadam, 5 per cent

for reinforced concrete and 20 per cent for lighting equipment (highway 16 ft. wide). The investment cost of lighting equipment is based on 300-ft. spacing, with 250-cp. "Mazda C" series lamp 30 ft. above roadway.

The investment shown above for highway lighting includes new pole line installed for the lighting units. This investment will be materially decreased where existing pole lines are used. It is estimated that such installations will cost installed about \$1,700 per mile.

General

Perhaps the most interesting test of modern highway lighting has been the lighting of the ideal section of the Lincoln Highway in Indiana. (See photograph of this lighting Fig. 2.) Here the results were very carefully noted as this was a model highway. Therefore it should be of interest to know that officials of the Lincoln Highway Association predict that within the next decade the entire 960 miles of highway between New York and Chicago will be illuminated. They believe that the increase in traffic and particularly the development of freight transport by fleets of trucks operating at night when passenger traffic is at a minimum, will make lighting absolutely necessary.

It is significant that these authorities are beginning to refer to highway lighting as an absolute necessity. And it is a necessity, just the same as anything else on which depends an important part of our modern transportation system. Not only is it necessary to facilitate night trucking, but it is a vital necessity from the standpoint of public safety.

The annual loss of life and serious injury due to automobile accidents is appalling and is receiving widespread attention. A large percentage of these accidents occur at night due to inadequate or im-



Fig. 2. Modern highway lighting on ideal section of the Lincoln Highway.

proper lighting. Headlight glare causes many accidents and this menace does not exist on a properly lighted highway. Modern highway lighting eliminates headlight glare because it removes the cause, which is contrast between the brilliant headlight and a dark background.

Summary of Advantages

There are other advantages of vital importance to the central station and to the community. Briefly some of the advantages worth serious consideration are as follows:

1. Public safety insurance. Prevention of accidents alone will save property worth more than cost of lighting, not to mention the more important saving of life and limb.
2. Increases trucking and other night traffic relieving day congestion. Also decreases running time.
3. Strong factor in farm electrification. Provides pole line carrying service to isolated districts.
4. Increases property values by promoting development along highways and by bringing electrical service with its conveniences to districts where the in-

* Report of subcommittee on Street and Highway Lighting; E. M. Koch, General Electric Company, chairman; R. E. Conlisk, Westinghouse Electric & Manufacturing Company.

vestment in transmission line would not be possible without the highway lighting as a foundation.

Already practically every state in the Union has installations of modern highway lighting. In several Eastern states many of the important highways have been illuminated and have attracted such favorable attention that plans are being made to light all highways.

The consensus of opinion seems to be that the cost of the lighting installations should be included in the cost of the highway. In several states laws have been passed enabling county supervisors to appropriate county funds for lighting highways. It is



Fig. 3. Highway lighting installation at San Rafael, Calif.

recommended that careful study be made to determine whether or not new laws are needed in California, in order to properly finance highway lighting on a statewide basis.

Because of its wonderful power development the Pacific Coast leads the world in the use of electrical conveniences. We are behind many eastern states, however, in the important matter of highway lighting. As soon as this condition is fully recognized the Pacific Coast will not be long in gaining the leadership in the use of electricity for highway lighting. Leadership in the East today is due to the fact that the advantages of highway lighting have been advertised longer and are better known there than in the West. It is therefore hoped that this paper will stimulate to some extent the interest that has recently been aroused on the Pacific Coast.

Many small installations have been made through the efforts of individuals and these will be valuable as basis for extensions and they can be tied together to form larger installations. A highway lighting demonstration was an important part of the All-Western Road Show Nov. 9 to 14, 1925. As a result the State Highway Commission will make a trial installation near Tracy. This will be watched with keen interest as it is the first step toward including lighting as a necessary part of highway construction and maintenance.

Power company interest has been shown by the Pacific Gas and Electric Company demonstration soon to be installed just south of San Francisco.

Various types of highway units are included and lighting results can be compared. Also the arrangement is such that 150-ft. and 300-ft. spacings can be compared and the lighting of curves can be demonstrated.

The demonstrations being made will unquestionably go far toward educating the motoring public, public officials, automobile clubs and central stations and thus gain the necessary support that eventually will make every highway in the West as safe and convenient at night as by day. What greater service can we of the electrical industry render our community, our fellow citizens and ourselves?

Recent Developments and Recommendation for Proper Street Lighting*

Previous committees have done a great deal of work and have covered the subject of street lighting very thoroughly. These previous papers have been successful in selling the idea of better street lighting. Therefore it will be necessary to devote very little of this paper to selling the value of street lighting to the central station.

A few years ago street traffic was slow and few people were out after dark. Obviously street lighting that was adequate in those days does not meet the requirements of high speed traffic and the increased nocturnal activity of today.

The moving picture and the automobile are largely responsible for the increased use of city streets at night. In our larger cities millions of dollars are invested in moving pictures and automobiles and in our smaller communities proportionate sums are invested, while a few years ago there was no expenditure at all. Modern street lighting is a necessary part of the higher standard of living, represented by the universal use of the automobile and increased expenditure for amusement and education.

The value of high intensity lighting in business districts has become generally recognized by business men and owners of business property. Most cities and towns therefore have fairly well lighted business streets, and those who haven't will not lag behind very long because of the active interest being shown everywhere by business and civic improvement organizations.

It is therefore safe to say that business streets will get their share of the street lighting appropriation, and in proportion to taxes paid they should get a large share. There is danger, however, that residential streets and traffic arteries may be neglected in an effort to light the business district without materially increasing the street lighting expenditure per capita. Considering the increased street lighting as a necessary part of our higher standard of living and necessary for public safety and convenience, the increased expenditure necessary to light properly all classes of streets, appears insignificant, especially when compared with the enormous increase in expenditures for automobiles, amusements, better homes, police, fire and health protection, parks, municipal buildings, etc.

The amount per capita per year a city or town will have to pay for properly lighting all of its streets depends somewhat on its size, density of population, traffic conditions and layout of streets. However, the following table shows the average yearly per capita expenditure based on the experience of well lighted cities throughout the United States:

Population	Per Capita per Year
Less than 5,000.....	\$2.50
5,000 to 20,000.....	2.00
20,000 to 100,000.....	1.75
Over 100,000.....	1.50

These figures are approximate and intended only as a guide. The actual amount any city should spend must be determined by first formulating a plan. The first step is to secure a large map of the entire city and lay out the streets in accordance with the following subdivisions:

- I—Principal Business Streets
- II—Secondary Business Streets
- III—Main Traffic Arteries
- IV—Secondary Traffic Arteries.

* Report of Street Lighting subcommittee: K. M. Koch, General Electric Company, chairman; R. F. Conlisk, Westinghouse Electric & Manufacturing Company.

- V—Residential Streets and Park Drives
- VI—Alleys.
- VII—Manufacturing and Wholesale Districts
- VIII—Highways and Undeveloped Districts

The above applies, of course, to a large city. However in laying out a plan for a smaller community the method is the same except certain classifications will not be used and the problem is therefore simplified in proportion to the size of the city. Where a city plan is available it should be used as the basis for the street lighting plan. If not available the street lighting map necessarily becomes the city plan. It is important to have the advice of city planning experts in connection with this work.

After the streets have been classified the next step is to specify the quantity of light for each classification. Lumens per linear foot of street have been generally accepted as the proper basis on which to classify the different degrees of street illumination. Table I gives general recommendations for ornamental street lighting and shows both the minimum and the most desirable lumens per foot recommended. It should be kept in mind that these classifications and recommendations are for cities of 100,000 population or larger and in the small city the main business street would be classed as secondary business in

TABLE I—GENERAL RECOMMENDATIONS FOR ORNAMENTAL STREET LIGHTING

Class of Street	Available Lamps	Mounting Height feet	Feet of Street per foot of standard	Lumens per foot of street
Intensive White Way	6.6 ampere luminous	18-25	50- 75	300-800
Arc Lamps	15,000 and 25,000-lumen Mazda lamps			
White Ways	6.6 amp. luminous arc lamps	14-16	40- 65	200-400
Principal business streets	10,000 and 15,000-lumen Mazda lamps			
White Ways	6.6 amp luminous arc lamps	14-16	40- 65	125-250
Secondary bus. streets	6,000, 10,000 and 15,000-lumen Mazda lamps			
Main Thoroughfares	4,000, 6,000 and 10,000 Mazda lamps	14-16	50- 75	80-150
Secondary Thoroughfares	2,500, 4,000 and 6,000-lumen Mazda lamps			
Residential streets, Boulevards and Park Drives	2,500 and 4,000-lumen Mazda lamps	11-14	60-100	25-50

TABLE II—RECOMMENDATIONS FOR OVERHEAD STREET LIGHTING

Class of Street	Size Lamp	Mounting Height Feet	Feet of Street per Lamp	Lumens per foot of Street
Main Thoroughfares	6,000 and 10,000-lumen Mazda lamps	15-25	75-150	80-150
Secondary Thoroughfares	2,500, 4,000 and 6,000-lumen Mazda lamps			
Main Residential	2,500 and 4,000-lumen Mazda lamps	15-25	75-200	25-50
Wholesale District				
Secondary Residential	1,000 and 2,500-lumen Mazda lamps	15-20	100-200	10-25
Highways, Alleys and undeveloped sections	2,500-lumen Mazda with Highway unit			

the larger city. Likewise the smaller city main thoroughfares should be considered as secondary. Residential streets if important enough to have ornamental lighting would be the same whether in a small or large city.

Outside of the business district, however, practically all lighting will be overhead. Table II of recommendations will serve as a guide.

It will be noted that slightly lower minimum lumens per foot of street are allowed for overhead lighting as compared to ornamental standards. This is possible because the pendant fixture with reflector or refractor delivers more of the available light down upon the street surface. In specifying the lumens per foot for any class of street it is important to use large lamps at the maximum spacing if necessary rather than use small lamps at the minimum spacing. By using large lamps a given amount of light can be secured for less money because large lamps are more efficient in lumens output per watt and a smaller number of large units means less maintenance than a large number of small units. In this connection it is recommended that no lamp be used smaller than

2,500 lumen, until every street intersection is provided with at least a 2,500-lumen lamp. The 1,000-lumen lamp may be used in the middle of the block in secondary residential sections where a light is needed and funds are not available for a 2,500-lumen lamp.

After determining the quantity of light the next step in formulating the plan is to select fixtures that will best meet the requirements. In the selection of lighting equipment perhaps the main items to consider are costs, appearance, illumination and depreciation. Table III shows in more detail what goes to make up these items and suggests weighing factors that might be used if an accurate comparison of several systems is to be compiled for a main traffic artery.

Table III

Basis for Comparison of Ornamental Street Lighting Systems for Traffic Arteries in Per Cent

Costs	30	Installation	15		
		Operation and maintenance	15		
Appearance	30	Daylight—standard and fixture	10		
		Night—of fixture	10		
		General—of entire street at night	10		
Illumination	30	Ability to see	20	On street	8
				At street intersection	3
				On intersecting street	3
				On sidewalk	2
				House numbers	2
		Absence of glare	10	Between houses	2
				From street	6
				From sidewalk	2
		From house	2		
Depreciation	10	Ability to stay clean	5		
		Ability to stay in adjustment	5		

Figures indicate percentage allotment or weighing factor for each fixture. Each item should be rated on a scale of 100 with regard to each characteristic. A final rating will then be derived by multiplying the rating of each characteristic by its weighing factor given in the above table and dividing by 100.

Some changes in weighing factors would be necessary for other classes of streets. Usually, however, an accurate comparison is not necessary if the selection is to be made by one with some experience in judging lighting systems.

Table III may be regarded as advice in the selection of equipment. Judgment should not be passed on only a few samples as it is the cumulative effect of a long line of lights that really counts. Installations of modern illuminants usually are available in nearby cities and it is far less expensive and more satisfactory to visit such installations for comparison than to attempt to duplicate them on a small scale in your own city.

One of the main advantages of a street lighting plan is the opportunity it affords for selecting standards and fixtures varying in size and output, but similar in design. Thus when the plan has been fully carried out the street lighting equipment is uniform in design, giving the streets a neat, orderly appearance. All of the best designs of ornamental fixtures and standards are now available in several sizes making up what is known as an "Architectural Family" of standards.

Of particular interest to the central station is the problem of furnishing satisfactory ornamental lighting without the necessity of underground construction. This has been met in many cases with entire satisfaction to all by the use of the ornamental trolley pole bracket. An example of this type is shown in Fig. 1. This has also been used on power company wood poles. Los Gatos is an example of this type of ornamental lighting. Twenty-five brackets are installed with the latest type of glassware and 10,000 lumen lamps.

Recent Developments

Practically all new installations are using the rippled or rectilinear type of glassware which has practically superseded the old style opal glass. This new glassware with its surface broken up into tiny hills and valleys has several important advantages

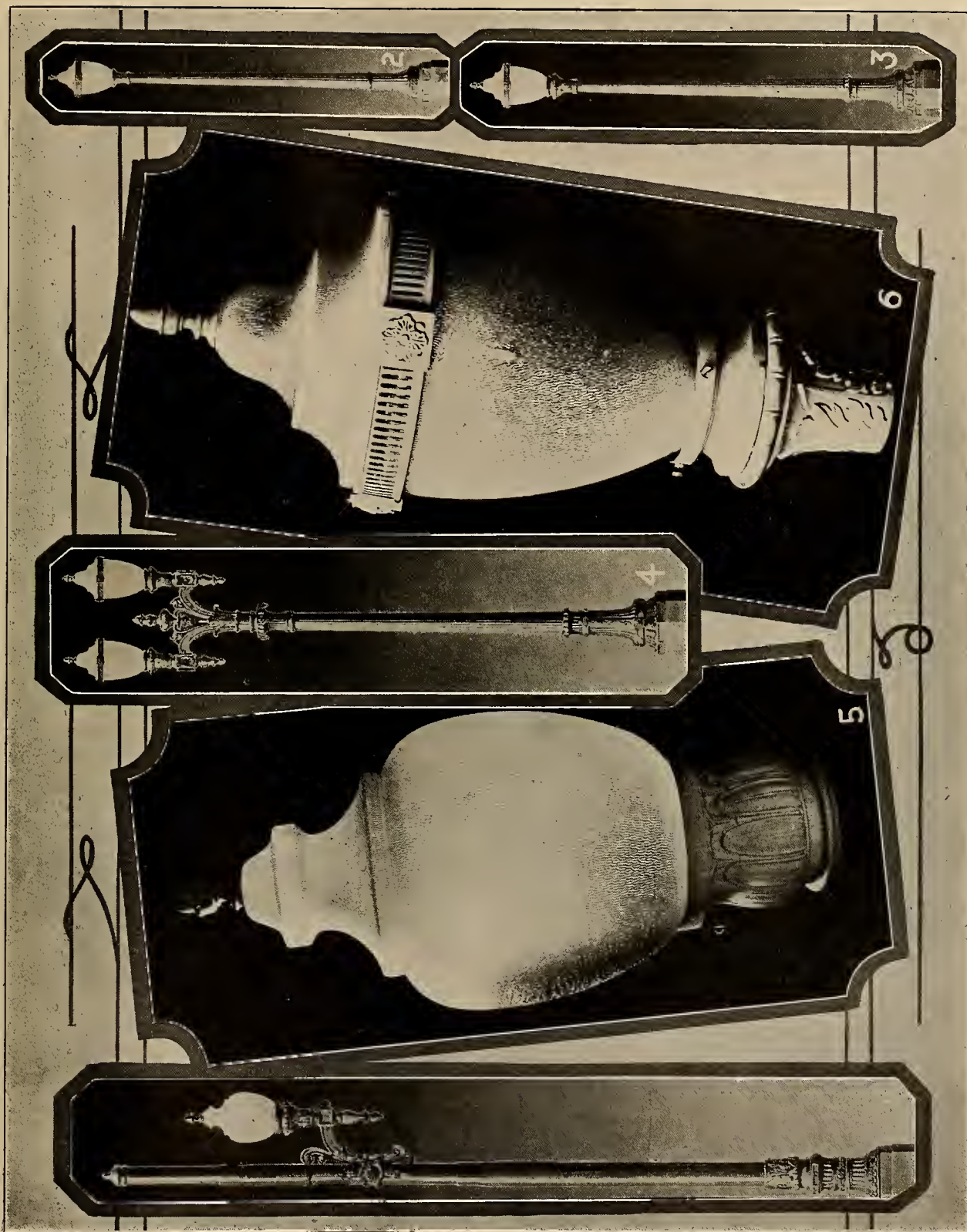


Fig. 1. Recent types of street lighting standards and luminaires. 1—New ornamental trolley bracket. 2, 3, and 4—Architectural family of standards. 5 and 6—New designs of street lighting luminaires made in several sizes for architectural families of standards.

over the smooth surface opal glass. Briefly these are as follows:

1. Less absorption of light. Light is diffused by uneven surface of glass rather than by opaque opal substance.
2. Sparkling appearance more pleasing both by day and by night.
3. Permits the use of refractors giving various types of light distribution.
4. Easy cleaning. Rain does not streak globe but dirt settles in ridges and is carried away.

Of the thousands of ornamental units being installed in Los Angeles and vicinity practically all are equipped with this new type of glassware. In the northern part of the state there are also many new installations of this kind. A few notable examples are as follows:

1. Geary Street, San Francisco, from Mason to Van Ness Avenue.
2. Bancroft Way and other streets in Berkeley.
3. Palo Alto.
4. Napa.

5. Burlingame (Broadway and Burlingame Avenue).
6. Mt. View.
7. Vallejo.
8. Turlock.
9. Delano.
10. Santa Rosa.

In Berkeley, Napa and Mt. View refractors are used. In Berkeley the dome refractor giving a symmetrical distribution is used and the Bi-lux refractor giving an asymmetrical distribution is used in Napa and Mt. View.

In addition to the improved glassware several new types of refractors have been developed. These are of asymmetric type and are designed to re-direct light from the sidewalk and the upward hemisphere, into an angle below the horizontal on the street side. Asymmetric distribution is ideal for residential streets if used properly so as to eliminate sharp contrast and glare.

Overhead Lighting Practice

For pendant lighting the totally-enclosing, bowl-type refractor has practically superseded the open band type, because it is dust and bug-tight. Also dust collection on the bowl does not reduce the light output to such a degree as with the band, and cleaning is easier.

Another advance that has been made in overhead lighting practice is the use of rigid-bracket or mast-arm mounting in place of center-suspension units. When only very small lamps were available it was necessary to hang the fixture directly over the street intersection to secure any effective light. With the

high intensity light sources used today better visibility is secured on the street when the lamp is mounted high or near the curb where it is out of the direct line of vision of the automobile driver. Rigid brackets or mast arms are recommended in place of center suspension for the following reasons:

1. Better visibility. Even when the unit is screened by tree foliage the light filters through and the freedom from glare is an advantage.
2. Better appearance of the fixture and of the entire street.
3. Ease of maintenance, because fixture does not swing in the wind.

Street Lighting Should be Planned

Referring again to the street lighting plan idea it is interesting to note that progress has already been made. San Francisco, Oakland, Berkeley and San Jose will install future street lighting in accordance with carefully laid out plans. Santa Cruz, Watsonville and Burlingame have recently relighted their entire residential districts in accordance with modern practice on the basis of a careful survey of the streets.

It is evident that street lighting has become one of the cities' major problems and one that offers the central station an opportunity to render service that will build good will and a desirable increase in load. This service apparently can best be rendered by means of a plan providing adequate lighting for all classes of streets and also providing for the use of larger lamps and extensions in the future.

Electric Truck Transportation Committee Report*

Review

The electric truck committee of the Commercial Section has continued, during the past year, to carry on a portion of the splendid work conducted by the transportation bureau during the preceding two years. However, because of the organization of a Transportation Section for a study of all phases of central-station transportation the question of the adaptability of electric trucks in such service, and in fact every factor entering into such application has been transferred to the newly formed Transportation Section.

1924 Report

In the reports of the transportation bureau submitted in June, 1924, a comprehensive outline of the development of the electric truck with its future potentialities was made. In these reports particular stress was laid upon the highly desirable class of revenue which would accrue to central stations from the further use of the super-electric appliance. These reports stressed the necessity of maintaining accurate cost data and also specifically urged that in furthering the sale of this appliance a special consideration should be given by central stations to its adaptability.

Incorporated in these reports were several comparative cost analyses which, while of unusual interest, might possibly have been misleading because of variation in cost accounting methods.

1925 Report

In the 1925 report of the transportation bureau it was decided definitely to eliminate any comparative cost data; to the users of electric trucks the economies had been definitely established and it was thought that further cost data publication might tend to confuse the issue in the minds of prospective purchasers.

It has been paramount in the minds of the members of the committee compiling the 1925 report, also that it was primarily important to convince the power companies of the possibilities which the electric truck offered for their own uses. With this thought in mind a considerable amount of technical data, from an operating standpoint, was incorporated in the report. At the same time it was pointed out to the power companies that to a large extent the general acceptance of the electric truck, by the transportation using public, was contingent upon the transportation policy adopted by the power companies.

With these thoughts in mind a series of letters was prepared and forwarded to central station executives, as well as to the heads of the sales and operating departments. Considerable time and thought were devoted to this series to the end that each letter should make a proper appeal to each of the three classes referred to.

1926 Activities

Subsequent to the preparation of last year's report of this committee the following activities may be chronicled:

Electric Truck School

An electric truck school was held in San Francisco just prior to the N.E.L.A. convention in June. This school was well attended, with a daily average of 35 and included representatives from Portland, Los Angeles and San Diego, as well as points adjacent to San Francisco. Representatives from many eastern factories were present and considerable impetus has been since felt as a result of this school. Both the street truck and industrial truck and tractor were well covered by the faculty.

*H. H. Singletary, Pacific Gas and Electric Company, chairman. L. F. Boerner, Electric Storage Battery Company, vice-chairman. W. J. Walsh, Great Western Power Company, secretary. Mercury Manufacturing Company: A. J. Anderson. Canavan Motor Company: J. J. Canavan. Commercial Truck Company: K. I. Dacey. Westinghouse Electric & Manufacturing Company: H. D. Easterbrook. Philadelphia Storage Battery Company: H. A. Fore. Western States Gas & Electric Company: H. K. Griffin. General Electric Company: D. D. Henion, Ed. Hunt. Electric Storage Battery Company: E. Kower. San Joaquin Light & Power Corporation: M. P. Lohse. Ward Motor Vehicle Company: L. L. Morgan. San Joaquin Light & Power Corporation: J. S. Moulton. Elwell-Parker Electric Company: I. G. Perrin. San Diego Consolidated Gas & Electric Company: P. P. Pine. Southern California Edison Company: C. R. Spurling. Edison Storage Battery Company: G. F. Wakeman. Auto Car Sales Company: A. Walthew. Los Angeles Gas & Electric Corporation: W. W. Willits.

The school was ably conducted under the personal supervision of C. R. Skinner, Jr., of New York City.

San Francisco Electrical Development League Luncheon

On the opening day of the electrical truck school a special luncheon, devoted to electric trucks was held, with an attendance to excess of 400. The meeting was addressed by A. E. Wishon, vice-president and general manager of the San Joaquin Light & Power Corporation, who delivered an excellent talk on the advantages of battery charging load to the central station and hammered home the necessity for power company support, both in use of trucks as well as in sales assistance.

Mr. Wishon "took off his gloves" and drove home fact after fact in a way which met with hearty, splendid and well deserved applause.

Electric Truck Parade

Immediately following the electric truck luncheon a street parade of some eighty electrics, passed the hotel in which the luncheon was held, rounding out Mr. Wishon's talk and picturing to the electric fraternity the fact that there are already many electric trucks in operation in San Francisco, and at the same time "selling the idea" of possible future development. To many the parade was an eye-opener.

N.E.L.A. Electric Truck Luncheon

Through co-operation with the N.E.L.A. we were able to arrange for an invitational luncheon for central station executives during the June convention. The luncheon was well attended, over 200 being present, including many of the outstanding executives of the largest power companies in the United States. Arthur Williams, vice-president of the New York Edison Company, delivered a splendid talk on the building up of battery charging load and then called upon several of the executives present for expressions of opinion. This resulted in many declarations of future policy on the part of the power company executives concerning electric truck use and promotion, the effect of which will no doubt make itself felt throughout the entire country.

Legislative Matters

Through the co-operation of the Electric Transportation Association a reduction in the state license fees on electric trucks has been obtained as follows:

$\frac{1}{2}$ and $\frac{3}{4}$ -ton trucks.....	65 @ \$20 each	\$1,300.00
1-ton trucks.....	248 @ 15 each	3,720.00
2-ton trucks.....	134 @ 20 each	2,680.00
$3\frac{1}{2}$ -ton trucks.....	23 @ 10 each	230.00
5-ton trucks.....	9 @ 10 each	90.00

Approximate annual saving to owners of 479 trucks.....\$8,020.00

The above tabulation excludes all electric trucks owned by public utilities which do not pay any license fees under our state law.

The association, through its attorney, has carried on a fight in the courts to have declared unconstitutional taxes previously levied against electric trucks. While the decision of the lower courts was unfavorable, and the state supreme court denied a rehearing, the action, we believe, will have a salutary effect on any proposed future legislation.

1926 Sales

At the preparation time of the last report there were in use in the state of California 930 street and industrial trucks and tractors. This has been increased by the sale of 98 trucks and tractors during the period covered by this report, which is slightly in excess of 10 per cent.

Educational Letters

This committee felt that the work of its predecessors largely covered central station usage, and it was believed that by means of an appeal to other prospective users, in various commercial lines, our field of activity might be enlarged considerably.

Working along these lines a comprehensive analysis of the logical prospective users of industrial trucks and tractors was made. From this survey has been

secured a very active list of actual prospects. The same procedure has been followed with electric street truck prospects and a series of letters, addressed to the executives of these companies, outlining the purposes of the Pacific Coast Electrical Association and the particular functions of this committee, have been prepared and sent out to 400 prospective industrial truck and tractor users and 350 prospective electric street truck users. These letters, which are appended to this report, consist of a series of seven letters to each of the two classes. It will be noted that these letters are predicated upon the broad ground of offering assistance in analyzing transportation problems and that they are purely of noncontroversial character.

Retarding Factors

Various developments in the last few years, particularly insofar as the local territory is concerned, have tended to retard the sale of electric trucks. Most of these conditions will rectify themselves.

In many of the logical fields of electric truck application commodity price wars have been in effect. Through eventual consolidation and stabilization these very industries are changing their transportation conditions to the point where ultimately the electric truck will be accepted as the most adaptable transportation equipment.

Conclusions

In conclusion, this committee feels, while the development of electric transportation may be comparatively slow at present, that it may express its confidence, nevertheless, in the ultimate future of the electric truck in this territory. To a large extent, however, this will depend upon the continued recognition and support of the central stations, both in their own usage and in sales promotion. The former results in minimizing sales resistance, imbues the truck salesman with added confidence and helps him to continue in his efforts to add other electric trucks to central station lines. Furthermore, with respect to sales assistance, a representative from a power company can approach a prospective user of electric trucks from the standpoint of a desire to render a service; consequently he is granted a more respectful audience and can more quickly gain the confidence of the power company's customers. That this is essential in the realization of a volume of sales of electric energy for charging batteries is thoroughly borne out by the experience of the eastern central stations.

Recommendations

For reasons already explained we again urge upon central-station executives, and operating, automotive and sales department heads, a serious consideration of the electric truck, as it must be through the active assistance of power company officials that we may look forward to substantial additions to battery-charging revenue.

We concur in the recommendations of the Society for Electrical Development for central stations, as follows:

1. Effective co-operation: (a) Have at least one man in the central station organization who is charged with the responsibility of developing electric truck business. (b) Have the power salesman talk electric trucks.
2. Include electric truck copy in the budgets for advertising (newspaper, direct-mail, etc.).
3. Include articles on delivery and electric trucks among data and information sent to local newspapers.
4. Recommend that central stations do not act as dealers for electric trucks.
5. When a man buys electric trucks, expedite the installation of electrical service.
6. Establish right off-peak power rate for charging electric trucks.
7. Increase public electric truck garaging and charging facilities.
8. Remove obstacle to electric truck sales due to cost of charging equipment by furnishing necessary equipment for converting alternating to direct current on a rental basis or including cost of it in charge for current or by arranging for purchase of it on deferred payment terms.
9. Use electric trucks themselves wherever applicable and use no other types of vehicles for their own service until definite investigation proves that the work cannot be performed satisfactorily by the electric.

Letters

Following are the letters sent out to prospective electric truck customers:

Street Truck Series

Millbrae Dairy,
855 McAllister Street,
San Francisco, Calif.

Attention: Mr. Frank Robb.

Dear Sir: The Pacific Coast Electrical Association is composed of central station companies, electrical manufacturing companies and kindred interests. Its object is to foster scientific research into the various branches of the electric industry.

The association has delegated a committee of its members to investigate electric truck transportation and the results of the efforts of this committee are to be made available to all interested industries. The object of this letter and the series to follow is to call your attention to the results revealed by the work of this committee.

The National Electric Light Association, with which the Pacific Coast Electrical Association is affiliated, is the largest organization of its character in the world. Its standing is such as to warrant your serious consideration of the facts which will be presented to you.

Yours very truly,

H. H. SINGLETARY,
Chairman, Electric Truck Committee,
Pacific Coast Electrical Association.

"Electric Fleets for City Streets"

Millbrae Dairy,
855 McAllister Street,
San Francisco, Calif.

Attention—Mr. Frank Robb.

Dear Sir: Mr. Bryan decided the question of evolution of man. Evolution of transportation is of vastly more importance to the present-day business man.

- 1803 Fulton developed his first steam engine.
- 1804 First practical locomotive developed in England.
- 1899 Motor trucks first used in transportation.
- 1910 3,255 gasoline trucks, value \$4,500,000.
- 1914 World War.
- 1915 25,375 gasoline trucks, value \$45,000,000.
- 1919 316,000 gasoline trucks, value \$465,000,000.

Emergency Act taking over railroads during the war forced purchase of gasoline motor trucks, which were capable of long hauls, to supplement inadequate railroad transportation.

Psychology of buying; continued purchase of gasoline trucks for congested districts.

PRESENT

Horses and gasoline trucks used in congested districts, causing costly congestion.

REMEDY

City ordinance taking horses out of congested districts. Quick accelerating electric trucks for short hauls and frequent stops in congested centers at 40 per cent less transportation cost.

Yours very truly,

H. H. SINGLETARY,
Chairman, Electric Truck Committee,
Pacific Coast Electrical Association.

"Electric Fleets for City Streets"

Millbrae Dairy,
855 McAllister Street,
San Francisco, Calif.

Attention—Mr. Frank Robb.

Dear Sir: Of the many items which go to make up "overhead," that of taxation is one of the most important.

While we may at times desire a more business-like handling of our national, state and municipal affairs, the fact remains that increased population and particularly population congestion is largely the basis of increased cost.

- Seventy per cent of the police force is used for traffic.
- Millions of money is being spent to hasten movement.
- Delayed traffic passes back incalculable economic loss.

SOLUTION

Quick accelerating electric trucks for congested districts at 40 per cent less cost.

Yours very truly,

H. H. SINGLETARY,
Chairman, Electric Truck Committee,
Pacific Coast Electrical Association.

"Electric Fleets for City Streets"

Millbrae Dairy,
855 McAllister Street,
San Francisco, Calif.

Attention—Mr. Frank Robb.

Dear Sir: During that period of 1920 and 1921, aptly termed the Reconstruction or Retrenchment period, every executive gave his personal attention to the fundamental basis of merchandising, namely, manufacturing and selling, with the necessity of reducing costs.

Did you give personal attention to your deliveries, or did you allow a subordinate to dictate that feature?

The profit of every article is increased or decreased by efficient or inefficient delivery service.

Goods delayed in transit represent frozen credit.

This important question needs your attention.

SOLUTION

Electric trucks are doing this for others.

Yours very truly,

H. H. SINGLETARY,
Chairman, Electric Truck Committee,
Pacific Coast Electrical Association.

"Electric Fleets for City Streets"

Millbrae Dairy,
855 McAllister Street,
San Francisco, Calif.
Attention—Mr. Frank Robb.

TRUCKS OR TRANSPORTATION

Dear Sir: When you require additional or replacement delivery units, which do you buy—Trucks or Transportation?

- Is the selection or equipment based upon—
- Reciprocal relations
- Personal friendship
- High-Pressure salesmanship, or
- Driver Preference?

Comparatively few transportation users analyze their hauling problems from the standpoint of adaptability.

Our expert will analyze your delivery service and render an impartial report to you.

Electric trucks are a "tailor-made" fit for city hauling.

Yours very truly,

H. H. SINGLETARY,
Chairman, Electric Truck Committee,
Pacific Coast Electrical Association.

"Electric Fleets for City Streets"

Millbrae Dairy,
855 McAllister Street,
San Francisco, Calif.

Attention: Mr. Frank Robb.

Dear Sir: In city deliveries, the higher maximum speed of the gasoline vehicle does not mean faster transportation; frequent delivery or traffic stops result in a higher average for the electric—more miles per day. In addition to this, it is a fact that frequent stop work not only increases the gas consumption several fold, but causes gasoline to go into the crank case and decreases the life of the gasoline motor in direct proportion.

Another feature is that owing to the easy movement and easy acceleration, an electric truck driver is much more efficient from a physical standpoint at any time during the day than with either horse or gasoline vehicles.

In the event you have not analyzed this potential saving in your delivery system, we recommend that you communicate with us in order that we may survey your hauling problem without obligation on your part.

Yours very truly,

H. H. SINGLETARY,
Chairman, Electric Truck Committee,
Pacific Coast Electrical Association.

"Electric Fleets for City Streets"

Millbrae Dairy,
855 McAllister Street,
San Francisco, Calif.

Attention: Mr. Frank Robb.

Dear Sir: In city deliveries, the higher maximum speed of the estimated when each route or hauling problem is figured on conditions of operation.

To state that the electric truck is more economical for all hauling and delivery purposes would be both ridiculous and untrue—BUT

If your deliveries come within the frequent stop class or if they are in the congested area, we say to you in no uncertain terms that the electric truck will effect substantial savings in your transportation costs as compared with gas truck deliveries. They will speed up your deliveries at the same, or less, cost as compared with horse-drawn vehicles. And public sentiment and sanitation are fast ruling the horse off the street.

A study of your conditions will enable us to tell you how much electric trucks will save you.

Yours very truly,

H. H. SINGLETARY,
Chairman, Electric Truck Committee,
Pacific Coast Electrical Association.

"Electric Fleets for City Streets"

Industrial Truck Series

McCormick Steamship Company,
Matson Building,
San Francisco, Calif.

Attention: Mr. Henken.

Dear Sir: The Pacific Coast Electrical Association is composed of central station companies, electrical manufacturing companies and kindred interests. Its object is to foster scientific research into the various branches of the electric industry.

The association has delegated a committee of its members to investigate electric transportation and the results of the efforts of this committee are to be made available to all interested industries. The object of this letter and the series to follow is to call your attention to the results revealed by the work of this committee.

The National Electric Light Association, with which the Pacific Coast Electrical Association is affiliated, is the largest organization of its character in the world. Its standing is such as to warrant your serious consideration of the facts which will be presented to you.

Yours very truly,

H. H. SINGLETARY,
Chairman, Electric Truck Committee,
Pacific Coast Electrical Association.

"Electric Fleets for City Streets"

McCormick Steamship Company,
Matson Building,
San Francisco, Calif.

Attention: Mr. Henken.

Dear Sir: It can be demonstrated to the satisfaction of any reasonable person that the Pyramids of Egypt and other similar monuments of antiquity could not have been constructed without the aid of mechanical devices. This, in spite of the fact that human labor was available at little or no cost, in unlimited quantities.

The entire story of the phenomenal rise of modern successful enterprises is that of the adoption of the latest types of motion saving, time saving, space saving and effort saving mechanical devices. There is no record available, for instance, of any large enterprise having abandoned the use of the extremely efficient industrial electric truck where it had once been used.

Yours very truly,

H. H. SINGLETARY,
Chairman, Electric Truck Committee,
Pacific Coast Electrical Association.

"Electric Fleets for City Streets"

McCormick Steamship Company,
Matson Building,
San Francisco, Calif.

Attention: Mr. Henken.

Dear Sir: Once upon a time a man with a progressive brain took a box with two handles, put a wheel underneath and moved more bricks per hour than had ever been done by anyone before in history. Somebody dubbed it a wheelbarrow, but it worked. The wheelbarrow has survived because it represented improved efficiency over cruder forms of handling goods.

Industry now makes use, where efficiency is held in esteem, of every known practical method of expediting the movement of merchandise, whether within a warehouse or from dock to steamship, truck to railway car, or even across the continent. These devices take the form of belt conveyors, chutes, express trains and even airplanes.

The standard device for moving material and merchandise over comparatively short distances, where floors are fairly smooth, is THE ELECTRIC INDUSTRIAL TRUCK. This is especially true in situations where dependability, space, and labor costs are important items.

Yours very truly,

H. H. SINGLETARY,
Chairman, Electric Truck Committee,
Pacific Coast Electrical Association.

"Electric Fleets for City Streets"

McCormick Steamship Company,
Matson Building,
San Francisco, Calif.

Attention: Mr. Henken.

Dear Sir: The man who pays the bills is usually the hardest to convince as to better or more economical means of handling material. The executives of all organizations are busy men, altogether too busy to get around to see what many other companies engaged in the same general line of business are doing.

There are very few jobs of handling material by man power where mechanical methods cannot be employed with proved economies.

In former days it required two men to steer a ship by hand, today they are steered by power. This same condition existed where hand hoists were used. Today power hoists take the place of man-power, saving time and expense. The same improvement marks the handling of materials on docks and in warehouses, where the modern electric truck or tractor effects savings of from 25 to 75 per cent in man power costs.

These definite savings warrant the earnest consideration of every business executive.

Yours very truly,

H. H. SINGLETARY,
Chairman, Electric Truck Committee,
Pacific Coast Electrical Association.

"Electric Fleets for City Streets"

McCormick Steamship Company,
Matson Building,
San Francisco, Calif.

Attention: Mr. Henken.

Dear Sir: We cannot foretell the exact amount of pay-roll savings that can be effected by the mechanical handling of your materials, but a thorough survey of your plant will enable the

submission to you, of an accurate and interesting statement of savings.

The electric industrial truck and tractor are manufactured in sizes and types to meet practically every plant condition, in fact there is an industrial truck or tractor to fit almost every conceivable condition, irrespective of width of aisles, radius of turns, inclines, etc.

Manpower costs money, and it requires less men to operate electric industrial trucks and tractors than any other method of handling material.

May we survey your problem without expense to you and without obligation on your part?

Yours very truly,

H. H. SINGLETARY,
Chairman, Electric Truck Committee,
Pacific Coast Electrical Association.

"Electric Fleets for City Streets"

McCormick Steamship Company,
Matson Building,
San Francisco, Calif.

Attention: Mr. Henken.

Dear Sir: Constantly increasing speed seems to be the requirement of the day, whether it be in the transmission of mails, passenger travel, or the transportation and handling of freight, local or long distance.

For instance, in Los Angeles several months ago, horse-drawn vehicles were ruled from certain congested streets during certain hours. The principal reason for this was to speed up traffic movement, because of the ability of motor traffic to move at higher speeds.

Because of the same demand for increases of speed, as well as greater efficiency in industry, all man-power methods of moving materials are no longer satisfactory and in many instances, not even possible.

Modern mechanical methods of handling materials have been the solution to this new requirement; electric industrial trucks traveling at three to five times the speed of men and moving from six to twenty-five times the volume per load, meet these requirements for speed and economy.

Yours very truly,

H. H. SINGLETARY,
Chairman, Electric Truck Committee,
Pacific Coast Electrical Association.

"Electric Fleets for City Streets"

McCormick Steamship Company,
Matson Building,
San Francisco, Calif.

Attention: Mr. Henken.

Dear Sir: We have been calling your attention, in the letters preceding this one, to an extended investigation which the Pacific Coast Electrical Association has been carrying on with regard to the present-day requirements relative to the handling of materials in industries.

The result of this research discloses, that due to the shortage of common labor and the highly competitive condition found universally, only in those industries where efficient mechanical material handling methods are utilized is profitable operation possible.

Our survey further shows that in California there are over 400 electric industrial trucks, tractors, crane trucks and special types of trucks serving the following industries to reduce handling costs:

- Automobile and tractor factories.
- Clay products factories.
- Fruit packers and sugar refineries.
- Grain and milling industries.
- Lumber industries.
- Mining.
- Oil refineries.
- Ship yards.
- Manufacturers, jobbers.
- Steel and metal products.
- Terminal, freight, express, etc.

In conclusion: Executives of above industries report a direct saving of 25 to 50 per cent on handling costs of commodities in their respective businesses by the use of Electric Industrial Trucks and Tractors. This warrants your interest and investigation.

Yours very truly,

H. H. SINGLETARY,
Chairman, Electric Truck Committee,
Pacific Coast Electrical Association.

"Electric Fleets for City Streets"

Power Committee Report*

The activities of the bureau this year have been somewhat different from previous years in two respects, first, there have been no papers prepared, and second, the bureau confined its work to one problem, namely, industrial electric heating.

The bureau felt that it could best serve the industry by acting as an influencing agency to create a greater and broader interest in the possibilities of industrial heating as a remunerative activity to the industry, and as an advance service to the public. We have carried on three major activities:

First, calls were made upon the executives of the utilities to give them first hand information on what a greater industrial heating load would mean to them in the way of increased load, improved load factor, improved diversity factor, and specific data have been put into their hands as regards many of the interesting and outstanding installations of electrical industrial heating that have already been installed on the Pacific Coast.

Some of the executives were already cognizant of these things and had put on their payroll special power solicitors to exploit this particular kind of business. It was found that other executives had not been inspired to do anything specific along this line, and it is hoped that the visits of committeemen will result in greater activity.

We have brought to the attention of the executives of the power companies the fact that there is in existence in the spring of each year, a two weeks' industrial heating school conducted in the East, under the auspices of the N.E.L.A. These schools are held one year at the factories of the General Electric Company and the next year at the factories of the Westinghouse Electric & Manufacturing Company, and in addition, visits are made to conspicuous and outstanding installations. To date, the utilities on the Coast have never sent representatives to these schools, and we specifically urged that each utility send at least one representative to the school to be held this year at the factory of the Westinghouse company at Pittsburgh during May.

Some of the companies felt that a school should be organized for the Pacific Coast. This does not seem practicable, however, upon further analysis, due to the fact that there are less than 20 industrial heating specialists in the employ of utilities and manufacturers on the Pacific Coast, and as it is doubtful if all of these men would, or could, attend a two weeks' school, it was felt by the committee that we could hardly expect the ten or twelve eastern experts who give instruction at the school to come to the Pacific Coast. A short course for power solicitors generally, would hardly be worth while, as the subject is a highly technical one and can only be handled successfully with extremely careful analysis.

Second, lectures are being organized, some of which have already been given, in the interest of giving general information to the electrical industry at large regarding the possibilities of industrial electric heating and what has been done on the Pacific Coast, the idea being that the more people we could get interested in, and talking about the matter, the more rapid would be the development of this class of business.

Furthermore, by having lectures given before some of the industrial organizations outside of the electrical industry, we have available an opportunity for showing the industrial institutions how they can improve their products or effect economies in their production methods by employing electricity for this pur-

pose. Very few people are aware of the advantages of carrying on industrial heating processes by electricity, as too frequently the only item given consideration is the cost of the fuel. As this report is being submitted, lectures had already been scheduled as follows:

San Joaquin Light & Power Corporation, Feb. 15.
Synchronous Club, March 30.
Joint Technical Societies, April 8.
A.I.E. Engineers, April 6.

Arrangements were being completed for additional lectures and it was hoped that before the annual convention in June many more meetings will have been held in different parts of the state.

Preparation of Reference Portfolio on Industrial Electric Heating.

Inasmuch as it was found that the various utilities did not have adequate information on the technique of industrial heating by electricity, and as no effort had previously been made to provide them with specific data and illustrations of Pacific Coast installations, it was felt that one of the most useful things we could do was to prepare a portfolio for reference purposes that would contain all this information.

In the limited time we had it was not possible to attempt to put out a formal and printed publication. We have, therefore, contented ourselves with preparing 25 copies of what might be termed an informal portfolio and is made up of data and photographs that are available in quantities of 25, from the various manufacturers of industrial electric heating apparatus and appliances. The portfolio is about 3 in. thick and depending upon the size of the utilities and the number of industrial heating specialists they have, the utilities will be given one or two copies of this. It will be leather bound and can act as a very excellent reference library, as it covers the subject very completely. The general character of the publication is as follows:

1. Heating Applications. A list showing all classes of commercial and industrial business with the possible heating applications.
2. Westinghouse Bulletin G-C. General Electric Bulletin. A general description of furnaces made.
3. Industrial Heating General.
 - (a) Paper—Selling Electricity for Industrial Heating by E. J. Cipperry.
 - (b) Industrial Heating for Factories. Wirt S. Scott. Reprint Westinghouse company.
 - (c) Industrial Electric Heating. N.E.L.A. Report, 1924.
 - (d) Electric Heat in Industry. General Electric company, 261.
4. Industrial Heating—Electric Bronze and Brass Melting.
 - (a) Paper, Electric Bronze and Brass Melting. A. E. Wilcox.
 - (b) Melting Bronze and Brass Electrically.
 - (c) Photographs of installation, General U.S.
 - (d) Photographs and data on installations, Southern California.
5. Arc Heating—steel.
 - (a) Paper by E. V. Kane, 1925, with list of installations on Pacific Coast.
6. Industrial Heating—Enameling Ovens.
 - (a) Electrically Heated Japanning Ovens. Wirt S. Scott. Reprint Westinghouse company.
- Low Temperature Electrothermal Process. Wirt S. Scott. Reprint Westinghouse company.
- Low Temperature Industrial Heating. Hershfield. Reprint General Electric company.
- Electrically Heated Ovens. Reprint General Electric company 48021-A.
 - (b) Data and photographs on installations Southern California, by manufacturers.
 - (c) Photographs of other installations by manufacturers.

The data and photographs of installations are to be separated into groups for the different classes of work, and in the industries they are installed.

* F. E. Boyd, General Electric Company, chairman. Pacific Gas and Electric Company: John Farley. Butte Electrical Equipment Company: Felix Butte. Westinghouse Electric & Manufacturing Company: T. A. Reid, Max Lee. San Joaquin Light & Power Corporation: M. F. Lohse. General Electric Company: E. J. Cipperry. Southern California Edison Company: A. A. Watson. Los Angeles Gas & Electric Corporation: Jack Wells. Los Angeles Bureau of Power and Light: E. V. Kane. Swartout Company: R. P. McKenzie. Quality Electric Works: T. A. Hunter. San Diego Consolidated Gas & Electric Company: P. P. Pine.

In similar manner core, baking, heat-treating and drying ovens will be covered.

While the present committee does not wish to be presumptuous in suggesting what future committees should do, at the same time, we take this occasion to express a feeling that we believe it would be of advantage to the industry for succeeding committees to maintain the portfolios and add new and up-to-date data to them from time to time as it is available; otherwise, much of the value of this work will have been lost.

The power companies receiving the portfolios are as follows:

Pacific Gas and Electric Company.....	3
Great Western Power Company.....	1
Western States Gas & Electric Company.....	1
San Joaquin Light & Power Corporation.....	2
Bureau of Light and Power.....	1
Southern California Edison Company.....	2
Los Angeles Gas & Electric Corporation.....	1
San Diego Gas & Electric Company.....	1
The Southern Sierras Power Company.....	1
McGraw-Hill Company.....	1

Transportation Section Reports *

Lubrication—A Study of Equipment and Practices

By E. B. WOOD and J. M. WAINSCOT

In presenting this paper, we believe it is best to confine ourselves strictly to the practical aspects of engine and chassis lubrication, as these important factors must be dealt with in the field almost wholly from the personal experience of men who are called upon to determine what corrective measures must be utilized.

Lubrication

Lubrication is an agent that reduces friction. In some form or other it has been employed since time immemorial. In choosing between brands of lubricants made from different manufacturers, the users should be governed largely by the integrity and good name of the maker. The poorer grades of lubricants often break down or become fatigued with use and become gummy and hard, or emulsify. Many bearing failures can be traced to cheap grades of lubricants.

Mineral greases and oils only are suitable; for instance, for ball bearings, it has been found that vegetable oils easily decompose and become rancid and acid. Also, the lubricant must be neutral since free acids or alkali will attack and corrode the surface of bearings. Greases which become gummy, sticky, hard or contain abrasives, such as gravel, sand, lime, etc., should not be used. The cost of lubricant is such a small item that the best is none too good.

Submitting that correct lubrication is one of the most important single factors governing successful motor truck operation, the purpose of this paper is to show:

1. What correct lubrication is, and its relation to motor truck operation.
2. How motor truck operators can control correct lubrication.
3. Reasons why such control should be exercised.

What Correct Lubrication Is

Correct lubrication may be said to exist when all bearing surfaces of an engine are kept separated by a suitable lubricant, which substitutes internal friction of the lubricant for destructive metallic friction between bearing surfaces.

For the lubrication of internal combustion engines, pure oils possessing the proper characteristics are conceded to be the best. Correct lubrication can only be secured by:

- (a) Using oils that possess all those characteristics or properties which make them adaptable to the needs of the engine in which they are used, and
- (b) By exercising the necessary care and precaution in seeing that the necessary and proper oils are supplied to the engine in correct amounts and removed from the engine when contaminated to such an extent as to make their further use inadvisable.

* S. B. Shaw, Pacific Gas and Electric Company, chairman; P. H. Ducker, Southern California Edison Company, vice-chairman; D. C. Bertrand, Great Western Power Company, secretary, California Oregon Power Company; D. A. Runyard; Coast Counties Gas & Electric Company; A. E. Strong; Coast Valleys Gas & Electric Company; G. A. Peers, Electric Storage Battery Company; W. E. Gallimore, Los Angeles Gas & Electric Corporation; W. J. Schaeffer, Pacific Gas and Electric Company; Russell Mills, E. C. Wood, San Diego Consolidated Gas & Electric Company; C. D. Weiss, San Joaquin Light & Power Corporation; D. P. Mason (member ex-officio); J. S. Moulton, J. M. Wainscoat, Southern Sierras Power Company; C. H. Gray.

It is on account of a disregard for these two fundamentals that automotive equipment prematurely outlives its usefulness in a very short period.

How Motor Fleet Operators Can Control Correct Lubrication

It is a misdirected impulse in economy which prompts a desire for long oil mileage rather than correct lubrication, and causes some operators of automotive equipment to use oils too heavy in body to permit of correct lubrication, resulting in early destruction of bearing surfaces, and so short economic life is the answer. Correct lubrication, however, is not obtained by simply replenishing from time to time the oil supply in crankcases with a suitable lubricant. Lubricating oils when functioning as lubricants are detrimentally affected by engine operation by having mixed with them:

(a) Unburned fuel, which passes from the combustion chamber by the pistons and into the crankcase, where it becomes mixed with the entire oil supply, causing a loss of body in the oil and lessening its value as a lubricant in proportion to the amount of fuel present. Unburned fuel causes what is commonly called oil dilution and it lessens the lubricating value of an oil more rapidly in most cases than any of the others because generally it passes to the engine crankcase in larger amounts than the other contaminants.

(b) Water, which is the result of:

- (1) Combustion of fuel,
- (2) Sweating of the interior surfaces of the engine and crankcase,

(3) Leaking of water and cylinder head gaskets.

This water which finds its way to the crankcase becomes mixed with the entire lubricating oil supply and in combination with carbon, road dust and other impurities that find their way into the oil, causes a heavy deposit or sludge, which, if present in sufficient quantities, will cause damage to bearings by stopping the flow of oil through oil pipes and screens.

(c) Road dust, which enters through the breather pipe, or is drawn into the cylinders through the intake manifold and is deposited on the oil film on the cylinder walls and together with certain portions of the oil drops back into and becomes mixed with the main oil supply in the crankcase.

(d) Carbon, which is formed in the oil as the result of high temperatures of certain parts of the interior of the engine. Any one or all of the above contaminants renders a lubricating oil unfit for use in proportion to the amount present.

The Reasons Why Such Control Should Be Exercised

Frequent changing of crankcase oil gives a definite and positive control over correct lubrication and satisfactory truck performance. If this control is not exercised and the engine is permitted to operate with a diluted and contaminated oil supply, the result will be high cost of operation, due to repairs.

Under ordinary operating conditions, it is advisable and economical to change the entire supply in the motor crankcase after not more than 500 miles of operation. In instances where operating conditions are worse than the ordinary, that is, in extremely cold weather, or under very dusty conditions, crankcase oils should be changed at much more frequent intervals. This committee feels that no definite rule can be laid down other than the rule that oil should be changed every 500 miles, but we do feel, however, that it is safer and more economical to change oil too often than not often enough.

Lubricating oil has a useful life that is governed solely by the rate at which the contaminants are added to it, the lubricating value of the oil being lessened by the contamination and not by any change

in the oil as a result of its specific functioning as a lubricant.

Why Engines Rust Inside

Corrosion in gas engines is believed to be due to the sulphur content in low grade fuels combining with water which enters or is formed in the engine, thereby producing sulphuric acid. Much of the trouble occurs in winter and may be traced directly to the action of water which condenses inside the cylinders, destroys the oil film and is deposited directly on the metal of the pistons and cylinder walls. Then the rusting or corrosion occurs, and if the lubricating system does not supply fresh oil immediately when the engine is started, scoring of the cylinders and pistons is likely to result. The only successful way of dealing with the condensation and rust problem is to provide a lubrication system that will start to function as soon as the engine is started.

TABLE I.—Lubrication Chart for applying the correct lubricant regularly and at definite intervals to the automobile chassis.

Element	Every Day	Every 500 miles	Every 1,000 miles	Every 2,000 miles
ENGINE PARTS—				
Oil reservoir.....	Examine or replenish with engine oil			
Fan Bearings.....	Engine oil or grease			
Valve Stems.....	Engine oil	..	..	..
Water Pump Bear.	Grease	..	..	..
Magneto.....	Engine oil	..	..	..
Electric Starter....	..	Engine oil	Grease	
CLUTCH—				
Lever Bearings of foot pedal.....	..	Engine oil	..	..
Cone Clutch Bear.	..	Grease	..	..
Cone Clutch leather surface.....	..	..	Neatsfoot oil	..
Multiple disc clutch	..	..	Clutch oil	..
TRANSMISSION—				
Friction Drive.....	Engine oil	Grease	..	..
Gear Shift Lever...	..	Engine oil	..	..
Gears.....	..	Gear oil	Grease	..
Planetary (Ford)...	..	Oil supplied automatically by engine oiling system.	..	..
UNIVERSAL JOINTS—				
DIFFERENTIAL—				
Gears.....	..	Gear oil	Grease	..
CHAIN DRIVE—				
Driving Chains....	Gear oil	..	Clean and soak hot tallow and graphite	..
Sprocket Bearings..	Grease	..	..	..
STEERING GEAR—				
Knuckles.....	Grease	..	..	..
Rods.....	Engine oil	Grease	..	..
Worm & Sector....	..	Grease or gear oil	..	..
Top of post.....	..	..	Engine oil	..
BRAKES—				
All Bearings.....	..	Engine oil	Grease	..
SPEEDOMETER—				
SPRINGS—				
Spring end and shackle bolts....	Grease	Engine oil	..	Grease
WHEELS—				
Front and Rear....	..	..	..	Grease

A study of the preceding analyses of the construction and operation of automotive equipment requiring lubrication, together with the appreciation, care and attention which the same should receive, and the use of correct high grade lubricants regularly in an intelligent manner and according to some definite schedule of application will insure highest lubrication efficiency.

Oil should be applied with an oil can by hand or by a suitable apparatus that will handle oil. When gear oil is used for transmission and differential, it should be an oil of high lubricating efficiency which will cushion the gears, allowing them to engage easily and without noise, and will not congeal at low temperatures. Where grease is specified, care should be exercised in its selection. A correct grease for general service is one that is smooth, light in color and medium body, carefully strained in manufacture and free from all particles of insoluble and non-lubricating matter.

Prevailing policy as to changing crankcase oil is shown in Table II.

A gummed label reading "Change Oil at—Miles" is placed on the speedometer and this procedure works out very satisfactorily. All companies use this method for control.

Dilution

In order to test and determine the per cent of dilution by inspection, the committee finds that the "A" company has been carrying out some tests along these lines. Fig. 1 gives the dilution in per cent; readings are degrees Baume. The dilution chart was calibrated by first diluting the oil with gasoline and the readings taken and checked by the dilution apparatus. The working temperature was 60 deg. F. The dilution test apparatus utilized the Tagg method. It consists of using 100 c.c. of oil in a 259-c.c. distillation flask and heating it with a Bunsen burner. Steel wool is used as a filter in the neck of the distillation flask. The vapors pass through the steel wool filter into a 12-in. water cooled condenser and then into a special capillary funnel with a 1/2-m.m. bore into an open cylinder measuring 1/10 c.c. This test is correct to within 2 c.c. and fairly rapid in operation, taking only 10 minutes per sample.

TABLE II.—Mileage at which crank-case oil is changed.

Company	Passenger Equipment	Light Truck Equipment	Heavy Duty Equipment
(A) Pacific Gas and Electric Co.....	750	750	500
(B) San Joaquin Lt. & Power Corp...	1,000	750	750
(C) Pacific Telephone & Tel. Co.....	1,000	1,000	1,000
(D) Coast Valleys Gas & Elec. Co....	1,000	1,000	1,000
(E) Southern Sierras Power Co.....	1,000	1,000	1,000
(F) Southern Calif. Telephone Co....	750	705	500
(G) Southern Calif. Edison Co.....	750	500	300
(H) California Oregon Power Co....	750	500	300
(I) San Diego Cons. Gas & Elec. Co.	750	500	300

In order to determine by inspection, the chart was computed with a known per cent of dilution, which range of dilution was taken at intervals of 5, 10, 15, and 20 deg. and the gravity readings plotted on the curve. The solutions were again made up and checked with the dilution apparatus and at the maximum were out but 2 per cent. This was considered a close enough range of accuracy. This chart was only usable with this one grade of oil, so a general chart within the range of all paraffine and asphalt base lub-

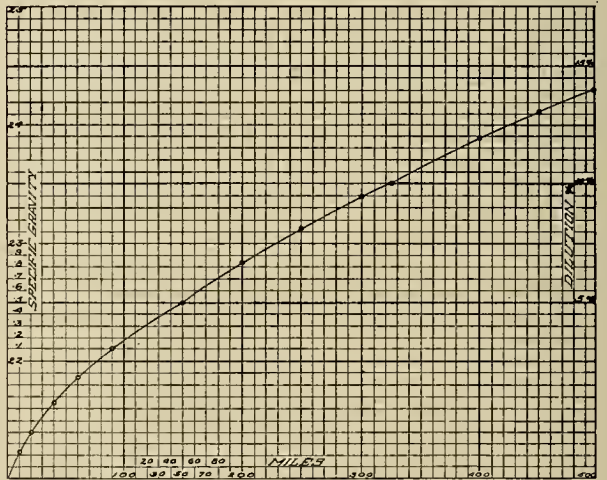


Fig. 1. Lubrication dilution chart showing the change in per cent dilution and the change in specific gravity plotted against the miles of service.

ricating oils on the Baume oil scale is in production. The results obtained with an oil agitation device and filters were given study also.

In winter weather with the street dirt being damp different conditions appear from which the data are not complete at this time. A close observation and tests are continually being made with this apparatus, however. The results so far have failed to give any marked saving in the dilution test. In abrasive tests the filter seems to stop at the larger particles but the smaller dust and abrasive particles pass through the filter.

The committee feels that the two factors of most importance in producing dilution are the excessive use of choke and the unburned gas passing by the piston and rings to the crankcase at low engine temperature. Tests show certain factors which tend to

eliminate this diluent from the oil. Water temperature should be approximately 170 deg. F. Also crankcase temperature is a factor that is of equal importance.

What remedies are necessary? Thermostats and evaporative cooling systems designed to maintain reasonably high jacket water temperature are among the items that should not be overlooked if engine life is to be increased. This is also a subject to which automotive engineers should give considerable thought.

Improved carburation and distribution, filtration of oil and cleaning of air, the means for quick starting and thus eliminating excessive use of choke, use of automatic radiator shutters and the education of operators, are mentioned as possible remedies for excessive dilution.

The following data were taken from H. C. Dickerson of the research department of the S.A.E. on vaporizing end points of fuel of the past and present standards:

1922.....	427 end point
1923.....	435 end point
1924.....	437 end point
1925.....	437 end point

Air Cleaners

Air cleaners were given some thought by this committee. Crankcase breather action is the cause of much oil contamination; the extreme case being that of an engine with unbalanced reciprocating parts, in which the crankcase volume increases and decreases by the piston displacement during each revolution, as a result of which there is a constant inrush of air into and an outrush from the crankcase. When the unit is being driven on dry dirt roads this air will contain a considerable amount of dust.

Research on air cleaners has shown that the best way to retain dust carried by an air stream is to bring it in contact with oily surfaces, hence it is probable that of the dust entering the crank chamber with the air through the breather very little passes out the same way again. It is true that engines are provided with openings in the crankcase, but these serve only as vents to keep the pressure within the crankcase at atmospheric level. If no such vent were provided leakage past the pistons would raise the pressure more or less above atmospheric level and there would then be a tendency to force the lubricating oil through the bearings and through any poorly fitted parts of the joints between the crankcase sections and between the crankcase and the cylinder block. Therefore in an engine with inherently balanced reciprocating parts practically no dust enters the crankcase directly, and this should tend to preserve the lubricating qualities of the oil and to reduce the wear considerably.

Tests were made on No. 1 air cleaners and No. 2 on White and Mack equipment of 3½-ton capacity. The method and apparatus used in the test follows:

A course was laid out one-half mile in length from a point on Fifth Street to a point at the curb line of Fifth and Townsend. This street has bitumen pavement and is considered level. In the following data the starting line will be designated as "A" and the other line one-half mile distant as "B." The method of measuring fuel consumption was with a dispensing burette connected to the carburetor, with a gravity head of 25 inches. The method of obtaining the CO₂ gas analysis was:

The analysis was taken after the water in the intake water manifold reached the temperature of 160 deg. F. and the r.p.m. of the motor set to a r.p.m. considered an economical efficient operating r.p.m. (This data was taken from manufacturers curves.) When the motor was adjusted to these specifications the CO₂ test was taken. The oil in each unit had been in operation for 300 miles and was sampled in the following manner:

The crankcase was drained and cleaned. The oil was then aerated and a 1,000 c.c. sample taken. The sample was then diluted in gasoline and filtered. The time factor did not allow a quality or quantity analysis so only the dilution test was made. The total weight of each unit loaded before the test averaged 19,000 lb. and the time over the one-half-mile course averaged 3 minutes per unit, or a speed of 10 miles per hour. Result of the test follows:

The White 3½-ton units were tested from A to B and from B to A with cleaners operating and removed. No carburetor adjustments were made and each unit was taken over the course twice to obtain averages.

TEST RESULTS

Fuel Consumption

	Whites—	From A to B	From B to A	Per Cent CO ₂ Test
With cleaner operating.....	550 c.c.	560 c.c.	7½	
With cleaner removed.....	530 c.c.	550 c.c.	6	
	Macks—			
With cleaner operating.....	650 c.c.	700 c.c.	9½	
With cleaner removed.....	550 c.c.	600 c.c.	6½	

The No. 1 cleaner installed on the Whites is of the fan impeller type which relies on centrifugal force to get results but as the fan's velocity increases with the acceleration of the motor, this seems to have a damper effect on the air intake velocity and in no way filters the air that reaches the carburetor. The oil test on Whites showed a residuum of foreign matter in the oil and the dilution test gave a 12 per cent to 12½ per cent dilution.

The Mack units with the No. 2 cleaner restrict the air velocity to the carburetor and the retardation of this flow is governed by the amount of material collected on the filter felt. The felt filter in this case did collect a certain amount of material, but no test was made to determine the saturation point of this material. The oil in the crankcase was treated as specified and the amount of foreign matter and abrasives considered below the average for the mileage operated. The per cent of dilution was 12 per cent to 16 per cent. We might add that the damp atmosphere of the Bay region materially affects and causes additional restriction.

Company C is figuring on standardizing on the United Air Cleaner.

Company D is contemplating standardizing, the make of air cleaner not yet decided.

Company E is contemplating standardizing, the make of air cleaner not yet being decided.

Company H is not contemplating standardizing on air cleaners.

Company I is not contemplating standardizing on air cleaners.

Oil Cleaners

There are several different methods of maintaining the cleanliness of oil in automotive equipment. These fall into several different classes. The first class relies on the prevention of dust entry to the oil system; the second class relies on the removal of impurities by filtration and the third class relies on distillation of unburned gas residue and is usually used in conjunction with one of the other types of cleaners. In all forms of this equipment, the use of good oil is of paramount importance, as all that is true of good lubrication under ordinary circumstances is given added significance when an oil is subjected to odd usage.

Dust Entry Prevention Type—In this first type of cleaner, the dust is either filtered from the air entering the carburetor by means of a framed cloth sack soaked in kerosene, or else the dust is entirely removed by increasing its velocity over that of the air through a venturi-tube, or again it is cleaned centrifugally by means of a fan. These devices are very simple and generally filter all but about 1 per cent of dust from the air entering through the carburetor. They perform a real service in that they reduce the grinding action of such dirt by keeping the oil free from hard particles, but they do not prevent contamination of oil either from minute particles of metal from the motor itself or from the oil, carbon and water sludges which may form in the engine.

Filtration Type—The second class of equipment simply filters out impurities in the oil by means of a cloth or screen placed in the oiling system. This apparatus is very effective in keeping the oil clean and may be used in conjunction with an air strainer. But it does not remove any dilution. One of the most common of this type on the market today is the No. 1 and it has given excellent service as factory equipment on several cars.

Another similar method is used in the No. 2 device. This apparatus combines filtration with removal of the dilution by passing a stream of air through the oil. The air naturally carries with it a certain amount of the volatile constituents of the crankcase oil, and

thereby reduces dilution. This apparatus has not been widely used as yet, but offers some promise of success as there is no appreciable burning action on the oil, the only disadvantage being that in the case of low quality oils, the oxidation sludge may be formed which will clog the filter and, in time, the oil lines of the motor.

Distillation Type—In those classes of purifiers which depend upon a removal of the dilution, the No. 3 and its modifications are meeting with the largest use. In brief, this machine draws a small quantity of oil from a small orifice near the bottom of the cylinder bore. This oil is carried to the upper dilution chamber, where the heat of the exhaust gases is utilized to drive out unburned gasoline and water vapors and the remainder of the oil is returned to the crankcase for further use. It is customary to use this equipment in conjunction with air or oil strainers, since there is no provision made to take care of foreign matter.

Good Oil Is a Necessity

Any oil will deteriorate from use, and while the filtration systems in use have little if any detrimental effect on the oil in the motor, since they are merely mechanical separators of dirt, it is obvious that a poor quality of oil will break down much sooner than an oil of highest quality, thus defeating the very purpose of the oil cleaner, which is to prolong safe lubrication. This is also true in the other systems in which air or heat is used to vaporize unburned motor fuel, which will harm inferior oils if they are not carefully watched and the flow of oil to them regulated.

A number of automobile manufacturers are including these devices on their latest models, and they have given good service to date. It may be that a more complete system can be designed in the future which will expel exhaust gases without the slightest chance of harming the oil or else will entirely prevent dilution. Until this system is designed, it is necessary to use the highest grade oils in motors employing heat or air as rectifying agents. And even then, since a rectifier is only an aid to lubrication, safe lubrication can only be assured through the use of the highest grade oil.

Oil Filters

There was a test made by the Company A of the No. 2 device installed on a Dodge touring car and operated four months to determine the amount of foreign material collected by the filter and also the per cent of dilution. The total mileage for this unit was 6,000 miles. The filter was then disconnected and cleaned and the insoluble material weighed and found to weigh 158 grams; the oil tested and found to have a dilution of $8\frac{1}{2}$ per cent.

The following test was made by an oil company of California under California conditions; tests being made by its laboratory. The analysis follows:

Item	Per Cent
Oil	32.8
Fuel	25.8
Water	40.0
Worn metal.....	1.0
Bearing metal.....	0.2
Dust	0.1
Carbon	0.8

The No. 3 system operates on a distillation principle. Excess oil is drawn off the cylinder walls by vacuum and is passed through an exhaust-heated rectifier in which the fuel particles are distilled off and returned to the intake manifold, while the purified oil is returned to the crankcase. The oil rectifier embodies a thermostatic temperature control which prevents overheating of the oil. As the distillation occurs under a partial vacuum, a temperature of 150 deg. F. has been found sufficient to distill off all but the heaviest fuel fractions. Through this method crankcase oil dilution is kept well below 10 per cent.

The oil rectifier proper is located close to the exhaust manifold, the upper part of the device being surrounded by a jacket through which part of the exhaust gases are by-passed. A hole is drilled through each cylinder wall just below the lowest piston ring when the piston is at the bottom of its stroke and

a manifold connects all six cylinder openings with the oil rectifier. Another important feature of this equipment is that a small hole is drilled through the wall of the piston in the bottom ring groove and diametrically opposite the oil hole in the cylinder wall. This allows oil or vapor from the crankcase to enter the ring groove from the inside of the piston, relieving the vacuum and allowing the excess oil to be drawn off the cylinder walls through the oil manifold.

The No. 2 device is designed to remove foreign matter, including dirt, fuel and water from oil in the lubricating system of the engine. Oil, together with some air, is drawn from the bottom of the crankcase of the engine through copper tubing to an exhaust-heated reservoir and thence is delivered into the upper air or float chamber of the tank. When the level in this chamber reaches a certain point the flat mechanism opens a valve and spills the oil from the chamber to one below it in which the filter is located. After passing the filter, the oil returns to the crankcase of the engine by gravity.

The No. 1 device consists of a process of microscopic filtration (not screening), by which process dirt is removed from the oil as the car runs. If installed when the car engine is new, this device will, we feel, postpone to a distant day the necessity for motor overhaul and at the same time will save 60 per cent of the ordinary engine maintenance charges. It also saves in oil, but this is but a small item compared to the way it saves the working parts of the motor from the damage caused by abrasive dirt in the motor oil. It aids the motor to more power and greater smoothness by aiding the engine to always have proper lubrication.

Reclamation of Oil

Many kinds of apparatus are on the market today for the reclamation of oil.

A crankcase oil reclaiming outfit has been developed by a well known separator company. For all practical purposes, the oil coming from this apparatus is re-refined. The process is simple and the outfit foolproof, and is easily handled by the ordinary garage help.

We find that this oil purifier has been used for a number of years by a number of truck and taxi cab fleet operators to centrifuge solid impurities and water out of their crankcase oil, in which service they have proved their efficiency and economy. Now this crankcase oil purifier provides a simple and economical means of restoring oil to its proper viscosity as well as removing solids from it.

The complete equipment consists of a purifier motor equipped for centrifuging out of the oil such solid impurities and water as it may contain; a wash tank for chemical treatment and washing of the oil in order to remove colloidal carbon; an oil pump motor equipped; electric oil heaters for keeping the oil at proper temperature during the process of purification; an air blower and evaporating tower to restore the oil to its proper viscosity; a strainer; a sight flow glass; electric control board and all piping and valves.

To give a brief description: the wash tank is filled with dirty oil, which is raised to a temperature of 180 deg. F. by circulation through the heaters. There is mixed with the oil in the wash tank a milk alkali solution. This coagulates the colloidal carbon, which is ordinarily very difficult to remove, so that when the entire mix is passed through the centrifugal purifier, as the next step in the process, both the carbon and the solution itself are removed from the oil. A quantity of fresh, clean water is then mixed with the oil and a thorough washing is effected by another passage through the purifier. At this point the oil is found to be free from solid matter and moisture and the next step is to restore its viscosity by passing it through the evaporating tower to drive off the light ends of unburned fuel with which it has become diluted. This tower is constructed so that the oil is circulated through it in the form of a fine spray, encountering a strong air current which effectively carries off the light volatile oils or diluents. The resulting viscosity of the oil is entirely dependent on the length of time the circulation through the tower is carried on.

Company A made some experimental tests with this machine, using Zerolene oil type "F." Report is incomplete at present but will be completed at a later date.

For the S.A.E. recommended practice on crankcase lubricating oils, reference to S.A.E. Handbook, Vol. 1, p. D151, is suggested.

Automotive Records and Accounting Practice

By C. D. WEISS and J. S. MOULTON

This subcommittee of the Transportation Section, consisting of C. D. Weiss and J. S. Moulton, was detailed to obtain the practices of the various utility companies in California as related to the keeping of records and costs for automotive equipment. At this date replies have been received from practically all of the companies having representation on the Transportation Section.

Your committee is taking upon itself the prerogative of drawing certain very general conclusions from these letters in place of outlining in extreme detail the methods employed by the various companies and in making recommendations as to those things which, in their opinion, would lead toward the adoption of a sufficiently unified method of record keeping to enable comparisons to be made between the several companies.

With one exception the companies all keep segregated records of operating expense for their different individual pieces of automotive equipment. The general segregation of these expenses into gas, oil, tires, repairs and general overhead is the same, although the detail of what enters into the various subdivisions varies somewhat with the companies.

The practice of charging for the use of the equipment on a mileage basis or on an hourly basis seems about equally divided. The arguments in favor of one or the other system seem to be based largely upon the use made of the equipment and no general rule should be urged for all companies. This feature is one of expediency to obtain the most correct charge for the use of the equipment and is somewhat outside of the realm of this report, which is concerned more particularly with keeping the operating costs of the equipment regardless of how they may be later cleared.

Recommend Standard Practice

Your committee recommends to the Transportation Section that the first move which should be made toward obtaining the adoption of records by the various companies which will be comparable is to have the representative of each company on the Transportation Section take back to his company a story of the purpose which it is hoped will be accomplished by the uniformity of accounting records and practices. It is more reasonable to expect comparable costs with companies all operating in California than it is to expect uniform costs from companies operating at greatly separated points in the United States, even though these companies may be under the direction of the same parent company. This fact should assist in persuading those companies which are directed by an outside agency that slight changes in their accounting procedure would enable both the usual reports to be made and reports for comparison purposes with other California companies as well.

If the various companies profess a considerable interest in the proposed general plan for unification of records, then a committee of the Transportation Section can, through a series of conferences, work out a plan which could be fitted into the various companies with the minimum amount of change. It would be extremely wasteful of time and unproductive of result to attempt to lay out such a plan if the companies for which it is done are to be entirely unresponsive to the results.

There were several pertinent suggestions in the replies received from the various companies which will undoubtedly be of interest to the committee.

Separates Construction and Operating

Company B states that in keeping group operating and depreciation costs "we also distinguish between

cars used in construction work and those used in operating. This we find has been a very important item, as cars used in construction work depreciate approximately 50 per cent sooner than those in operating work, and as construction work is mostly chargeable to capital accounts, it is very essential these costs should be reflected in our capital accounts rather than be absorbed in a group average of operating department cars."

Company E charges the difference between the estimated salvage value of a piece of equipment and the realized salvage value to the cost of the new unit. Several of the other companies keep a depreciation adjustment account and do not burden or relieve an individual new piece of equipment with the inaccuracy in estimating the salvage value of the old equipment. The method of using the general depreciation adjustment account appears to this committee to be preferable.

Charging Garage Building Rental

The detail of the garage overhead account varies more than do the other accounts and seems most productive of error if costs including this account are compared. Among other items entering into it is that of rent on garage buildings. Two examples will be given to show how this item alone can considerably affect the result.

Assume two companies having garages of equal floor space and efficiency and both costing the same amount to maintain. One of these garages is rented from an outside owner by the company, while the other is owned by the company itself. In one case the rental for this building would be included as a garage expense; in the other case no similar charge would appear as the interest and depreciation on the investment; the maintenance, taxes, etc., would not be chargeable to this account. Cost comparisons between the two companies under this condition as regards the garage expense would be faulty.

As the second example, two companies rent garage buildings of equal car capacity; one of these buildings being located in a small town where land rent and taxes are low; the other being located in a large city where land rent and taxes are high. Such conditions are outside of the control of the transportation department, and its general garage expense, while reflecting the difference in these items, would not be a criterion of the efficiency of the transportation departments of the two companies.

In conclusion it is the recommendation of your committee that before further detail work be undertaken toward the setting up of a method of producing uniform account and record keeping practices as relating to automotive equipment in the various Pacific Coast companies, that expressions be obtained from these companies as to their attitude toward accepting and putting into force such a plan.

Electric Trucks—Their Selection and Application

By W. E. GALLEMORE and D. C. BERTRAND

Economy and satisfactory operation of electric trucks, as well as of other types of transportation equipment, depend upon a thorough analysis of specific requirements:

In considering the type of equipment to be selected the character of the work to be performed is the principal factor. It is just as wrong to place a gasoline driven vehicle on short-haul, frequent-stop work as it is to attempt to use an electric truck for long distance hauling. While it is true that in the gasoline truck we have a unit which is far more flexible, it is also unquestionably true that the electric truck, in its proper field, possesses many advantageous features.

While the greatest efficiency of the electric truck is obtained in delivery and pick-up service and in congested traffic areas, actual comparative tests conclusively demonstrate, in certain instances, a greater efficiency for the electric truck in central station service involving relatively few stops, providing that service is within the cruising radius of the electric. This cruising radius depends upon—

(1) Load Conditions. Whether the load remains constant throughout the period of operation; whether it diminishes and at

what rate, as well as possible over-loading are factors to be considered.

(2) Topography of Route: General road conditions and gradients are of vital importance. They pertain directly to the application of electric trucks and affect the radius of operation, although we have many successful installations where hills of an extreme nature are encountered.

(3) Stops: In practically every class of hauling which necessitates frequent starts and stops, the speedy acceleration and ease of operation of the electric truck render it the most efficient and economical unit of transportation.

(4) Time Element: The period of time in which it is necessary to handle the given work is of vital importance and the electric truck stands out favorably in congested traffic areas in cities as well as for reasonable suburban service, owing to its constant speed.

Selection of Electric Truck Transportation Equipment

We believe that the most satisfactory installations of electric trucks are those in which the work to be done has been surveyed by the electric truck itself, which makes possible its direct application to that particular work. This may be done in the following manner:

(1) Chassis: This should be considered from the standpoint of load capacity as well as design.

(2) Motor: The rated voltage and amperage of motors, in connection with gear ratios, should be considered as to their relation to the conditions under which truck is to operate.

(3) Controllers and Other Auxiliary Equipment: Owing to the nature of the draw on the source of power, controllers are designed very liberally and have met general applications in this field with excellent results where a reasonable degree of maintenance is given.

(4) Storage Batteries: The voltage of the battery should be figured in proportion with the motor of the vehicle being driven, as well as charging conditions which may exist. Reliability and economical life, as well as suitable operating characteristics, are the desired features from the storage battery end. Likewise important is its efficiency in delivering the energy required for the satisfactory operation of the vehicle.

(5) Charging Equipment: Charging equipment should be selected to meet the requirements of the batteries. It is not necessary to install elaborate equipment, which in some cases has been done, but simplicity of arrangement is desirable. Manual or automatically controlled apparatus may be selected to meet conditions.

We believe that electric transportation has been developed to the point at which it is well deserving of consideration for application to any work within its field.

Repair Shop Equipment and Methods

By V. W. DENNIS and D. P. MASON

As the various company shops covered in this paper are operating under such varied conditions it was felt that the method used was of more importance at this time than the equipment used, so methods only will be considered at this time.

From the questionnaires made out by the various operators it appears that their operating conditions and number of vehicles operated call for an entirely different shop and maintenance set up.

Two companies only consider it necessary to overhaul trucks annually, the others overhauling whenever it is considered necessary from a mileage basis or from inspections or reports from their shop forces. This appears to be at intervals of from 1½ to 4 years. Dodge and Ford trucks are considered on the same basis as the larger trucks. Dodge passenger cars are overhauled whenever their condition warrants it, although one company overhauls or trades them in when they have gone 40,000 to 50,000 miles.

Ford passenger cars when overhauled are handled on a mileage or condition basis, although some of the companies using a large number of Fords are only doing light overhauling and when the car is in need of a major overhaul, it is turned in on new equipment.

Overhaul Methods

Eight companies consider regrinding the proper way to refinish cylinder blocks, two companies rebore and hone. The variations in cylinder wear before refinishing are from 0.003 to 0.015 in diameter and approximately the same for taper. This variation, of course, is regulated by operating conditions to a great extent, but it is a subject that should call for some discussion, as it has a large bearing on economical operating. Standard valves and piston rings furnished by the car manufacturers are universally used except that oil scraper rings are considered necessary.

Where special jobs call for other than the standard valves the Jadson or Thompson Silachrome valve appears to be the most popular. The use of mechanical devices for bearing work does not appear practical for small shops, but in shops handling a large volume of work they are considered a necessity. The reamer type for main bearings are the most used. This type was one of the first introduced which may be the reason for its popularity. Most of the connecting rod bearings are scraped by hand, but where mechanical devices are used they are usually of the fly cutter type.

The time used for running in motors after overhauling varies from 2 hours to 8 hours. Six companies use the unit system of motor repairs, principally on Fords. This is a system requiring a large fleet to operate successfully.

Pits of the closed end type are used by all companies.

Overhead cranes in the larger shops and portable cranes in the smaller ones are used in preference to the elevated runways.

Two companies use portable benches and five companies use special benches for their mechanics' use.

Hand tools are furnished by only one concern. Steam cleaning plants are considered a necessity in the larger garages.

Painting of Equipment

Vehicles are usually painted whenever needed, although two companies paint at regular intervals. Six companies use a quick drying paint or enamel. It appears that approximately 24 hours is considered as quick drying. Seven companies apply paint by the air spray system which is usually of the stationary type, and in each case is applied by regular painters.

Inspectors are used by seven companies and it is the general rule that the inspector takes care of adjustments and light or emergency repair work, although in two companies he does only the regular inspection work. These inspections are made as required, weekly, monthly or annually, varying according to the class of work taken care of. Vehicles overhauled are usually inspected by the garage foreman, except in one or two companies. Only three companies use a regular inspection form.

Trouble shooting and motor work is done by specialists in six companies. These companies as a rule employ apprentices rather than helpers or handy men.

Garage and shop men are paid usually on a day or monthly basis.

It was considered advisable to use the operating procedure of one shop as an example. This was furnished by Mr. Wainscoat of the San Joaquin Light & Power Corporation.

Cylinder Refinishing

There are several well known processes for cylinder refinishing. In all probability the most commonly used are regrinding, honing and lapping. However, it is our experience that the latter two are not necessary except in rare cases where a temporary or partial correction is desired, but in point of economy, accurate

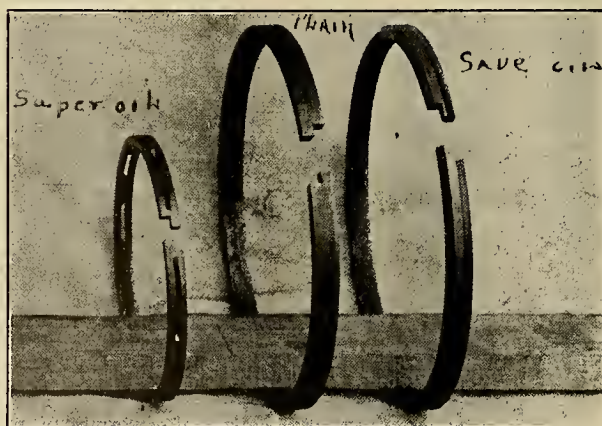


Fig. 1. Types of rings used. Center ring is plain ring used for first two grooves at the top of pistons. Left ring is of oil ring type, as is the ring on the right with a beveled groove running around it.

work and general efficiency, we have found regrinding, if properly done, to be the only satisfactory means of cylinder renewing.

It has been our experience that with the use of a Heald grinder, such as we use, a proper placing of the block in order to secure a minimum removal of metal is quite necessary. At no time should a cut of sufficient depth be taken as to cause a strain upon the arbor or generate heat to any degree within the cylinder wall being ground. Either of these, we have found, will cause an untrue wall after the cylinder has been allowed to cool. The last cut should be made very light and without crowding. If care is used it will be found that a very smooth, satisfactory

heat and oil develop a thin, hard, skin-like surface which in most cases is sufficiently hard to turn the point of a sharp lathe tool.

Rings—Types Used and Refitting Methods

We are using a plain, turned, step-cut ring of low cost. (See Fig. 1.) These rings are fitted with practically no gap allowance for expansion, due to the fact that they are turned in what is known as semi-rough state, which gives them a uniform, quick seating feature. However, care should be used to see that each ring fits easily and freely in its ring groove. These rings must not have a compression tension, to close the gap, or greater than 7 lb. (see Fig. 2), as



Fig. 2. Rings are fitted so that they will close with a pressure of seven pounds.

job can be had with the removal of a minimum amount of metal. An accuracy of 0.00025 variation is more than sufficient for perfect performance. At the time cylinder blocks are refinished, the valve seats should also be re-established for the purpose of securing a narrow seat, one without pockets or ridges about the edge of the valve proper.

We now come to the question of proper pistons and the fitting of them to the block. Through much experimenting we have developed the use of medium weight gray iron pistons for replacement purposes in all regrind jobs. These pistons, when properly centered and turned, are given a clearance of 0.00075 to the inch of piston diameter.

In most cases indeed these gray iron pistons will exceed in weight but a few ounces the present day popular, light weight, alloy piston, although in performance and greater over-all efficiency they will outwear two to three sets of alloy pistons, both as to measurement for wear upon them and upon the cylinder block. This may seem strange but careful measurement and inspection will soon convince one. Alloy pistons although light and apparently soft, are surprising in that aside from the fact that they require a greater allowance for expansion, they will wear the cylinder walls as much as 0.008 or 0.009 in the low mileage of from 10,000 to 12,000 miles. This is due to the fact that alloy pistons when subject to

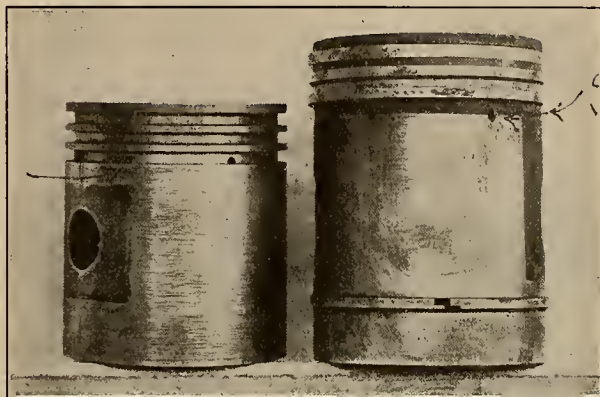


Fig. 3. Holes drilled in the pistons at the lower ring groove to drain oil. At left the present practice is shown. At right the old method of drilling now abandoned.

our experience has shown that a ring of greater tension will not only increase friction and wall wear but also will not properly fit itself, due to the peculiar characteristics of ring stock when subjected to heat and pressure.

This type of ring we place in the first two grooves upon the top of the piston. The third groove is reserved for an oil ring. We drill five 3/32-in. holes at the inner lower edge of the latter ring groove to serve as a drain. (See Fig. 3.) The oil ring is nothing more than a ring of the same tension, quality and design as the two above, with the exception that a V-shaped groove is cut in its outer lower edge or face to a depth of approximately 1/16 in., and the top edge is bevelled to the same degree. (See Fig. 1.)

We have also used other oil rings with practically as good results. It will be noted that both piston and ring are turned instead of ground, the reason for this being that a turned piston or ring retains an ability to carry a sufficient amount of lubricating oil to protect it from freezing or scoring while in the process of running in.

The wrist pin bosses are reamed with spiral reamers, with just sufficient clearance to permit the connecting rod to fall from a horizontal position of its own free weight. The rod and piston are now ready for a check as to alignment, for which purpose we use an Erickson aligning jig. Care must be used in this operation as a slightly twisted or cocked wrist pin or rod will cause excessive oil pumping as well as cylinder and bearing wear, and in many instances, high metallic knocks in the motor.

Cylinder blocks fitted in this manner have given us an average life greater than any so far secured in new equipment and with a minimum amount of trouble.

It might be well to suggest at this time a careful inspection of all water circulating ways in or about the valve seats and cylinder walls. We have found in a few special cases that cracking of the cylinder walls or valve seats is likely to occur if for any reason these passages are in any way clogged with foreign matter. Particular attention along this line is necessary in a few motors. The water passages in certain types of motors near the valve seat are very small in size and subject to frequent clogging. The cylinder block is now ready for installation upon the crankcase.

Reassembly Practice

It is advisable, we find, to tighten the studs which hold the block to the case which are located between number 2 and 3 cylinders, and then working from this point toward each end of the block. This will lessen any chance of oil leakage or springing of the case. The same procedure is also advisable when installing the cylinder head.

We are now ready to insert the pistons and connecting rods within the cylinder, and connect up the rod bearings to the crankshaft. We find through experience that in connecting the rod bearings to the shaft that a clearance of from 0.001 to 0.002 is to be preferred over a snug or tight fit. We also find that where the shaft is out-of-round by not to exceed 0.0015 or 0.002 in., no harm will result to speak of. However, any greater amount of out-of-round will cause a shortening of bearing life. We find in actual practice that connecting rods and main bearings composed of pure block tin to the extent of 80 per

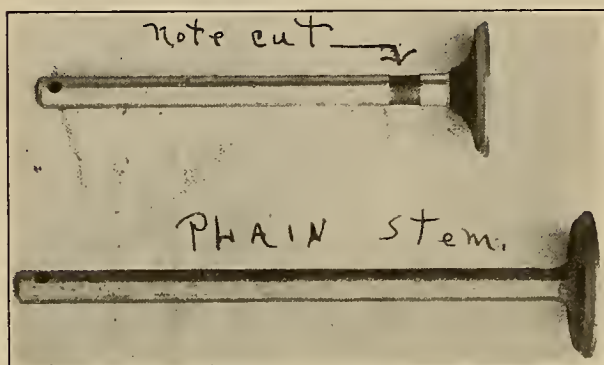


Fig. 4. Valve stem recessed to eliminate sticking, as compared to the ordinary valve in the lower example.

cent copper and antimony comprising the balance, give us the least trouble and the greatest amount of mileage. Bearings of the above type may be purchased from almost any of the reliable parts companies, and also seem to be in use on many of the more recent motor cars.

Consider Valves

We will now consider valves. At present there is much discussion on this subject. However, we find that although valves may be obtained under various trade names, nevertheless they are made up mainly of the following metals: tungsten, silichrome or cast iron as a head metal, with various processes being used for the heat treating of them. We have tried valves in all of the metals mentioned and have practically adopted as standard a tungsten valve.

This valve, although not as high in heat resistance qualities, nevertheless is sufficiently high to be above normal operating temperatures. Perfect satisfaction should result in every instance where they are used with the possible exception of those few cases where other motor action, such as defective gasoline, poor water circulation, or improper tappet setting, interferences. In those few instances, sticking valves or burned seats may result.

In practice, to eliminate burning through tappets being adjusted too high, we have found that a clearance varying from 0.004 to 0.010 is used, due to the grades of iron used by different manufacturers in cylinder block casting and their processes of treating. Some blocks have a growth or expansion under heat in the same ratio as valves, in which case the adjustments may be as low as 0.004 for clearance. However, in most cases valve stem expansion may be as much as two or three times the growth or expansion of the block. This difference must be measured and compensated for in the valve tappet adjustment. We find that if this practice is carefully followed no trouble will result.

In most cases where trouble is experienced by carbonizing or gumming on the stems below the head, due to effective gasoline, relief may be had by turning the valve stem or recessing the valve head a dis-

tance of 1/16 in. below that point at which the top edge of the valve guide rubs, and to a depth of 1/32 in. (See Fig. 4.) This gives the guide a shearing effect upon the valve stem at the point of trouble. It also prevents carbon and gum from piling up sufficiently to cause a shoulder which might cause the valve to hang or hold open.

Valve grinding in present day motors is largely required because of the condensation in the valve cover chambers, due to improper lubrication and venting, or poor quality of gasoline. Cases of valve grinding through normal wear are rare. In fact it has been our experience that a motor will operate with present day valves under normal conditions over a period of from 10,000 to 12,000 miles without loss of efficiency. In some rare instances we have found valves defective or seating improperly due to unusually soft valve seats, which permit the valve to heat itself down to a point where the stem rides the tappet. In this case, unless properly cared for, a burnt valve will result.

What Causes Valve Trouble

Condensation we have found, causes an accumulation of moisture about the valve stems, which in turn sets up a corrosive action causing the stems to stick in the guides. We have overcome this by drilling from the valve chamber into the crankcase proper, thereby permitting added lubrication to the springs and stems. This also provides a means of air circulation having a tendency to check the condensation.

The question of poor quality gasoline is one which at one time gave us considerable valve trouble. Gasoline is made in two classes or specifications. One is known as aviation gasoline and the other motor gasoline. These classes are established by the U.S. Government under its specifications. Motor gasoline, to be high grade, refined and free from water and all impurities, must have a vapor tension not greater than 10 lb. per sq.in. at 100 deg. F.

These requirements are designed to prevent the addition of too great a percentage of casing head gas and are usually covered by the initial boiling point, rather than an estimation of vapor tension. We would suggest an initial boiling point not less than 108 to 110 deg. F., using 100 c.c. as a sample. The boiling point must not be higher than 140 deg. F.; 20 per cent must distil below 221 deg. F.; 45 per cent must distil below 275 deg. F.; 90 per cent of the sample must distil below 360 deg. F., and the end-point should not be higher than 437 deg. F. Slight color is not to be regarded as having much significance.

However, the doctor test of gasoline should be negative and in the corrosion test, gasoline should



Fig. 5. Oil record chart maintained at the main garage. Each car is given a numbered button, which is stuck into the board in a space allotted to the division in which it is operating at a point opposite a date at which it is to be relubricated.

show no grey or black corrosion and no weighable amount of gum. The maximum allowable residue in the corrosion test is 11 milligrams for 100 c.c. of gasoline. Occasionally gasoline contains heavier oils which do not volatilize at the temperature used in this test. Such oils will run the residue much higher than the limit allowed.

We have given the above specifications in order to make clear those parts which cause serious valve

trouble. Those parts may be found in the amount of corrosive and residue contained as well as in the doctor test. Unless these are as specified herein, a heavy gum coating will develop on the valve stem due to the heat action upon the gases. This gum, we have found, will cause valve stems to hang open within as little as 500 miles running and upon cleaning and regrinding to repeat hanging up within the same mileage. Therefore, we analyze our gasoline periodically. Since the adoption of this plan we have experienced a minimum of valve trouble.

Shop Equipment

From time to time we have tested out and adopted various kinds of shop equipment. And we have rejected many others. We have so arranged the garage, that each mechanic has his individual bench and floor space, with complete electrical equipment for drop lights, electric drills, etc. Pits are provided at various points in the garage in order that repairs may be made conveniently beneath the car or truck.

The garage is heated throughout the winter months by means of oil burning furnaces, in which old cylinder oil and distillate are used on a 50-50 basis. The average temperature maintained is from 60 to 65 degrees, this having been determined as the most satisfactory working temperature. A large wash room is provided with hot and cold water wash trays and individual lockers. In the summer months complete ventilation is made by means of window ventilators, overhead skylights and large doors.

A 20-ton capacity, screw-type press is conveniently located in the garage, as well as a direct-drive, double-arbor, motor-driven emery wheel. Adjoining and in conjunction with the garage, is maintained a complete machine and blacksmith shop in which machinery for all classes of wood working is to be found, also a complete equipment for forging and blacksmithing. We also have acetylene and electric welding equipment. In the machine shop proper are to be found a Heald grinder of the latest design, a large Universal grinder, four different types and styles of lathes, a large and small drill press, a tool grinder, a miller and shaping machine and also a power hack saw. This machinery is all electrically driven and operated by competent machinists.

These machines, as well as all other garage apparatus, are completely equipped with the most modern safety devices. We have a safety committee composed of members chosen from each department. It has regular monthly meetings and discusses any new hazards which may develop, as well as motor car accidents and personal injuries. Its report is then filed with the central committee for further action.

Fire extinguishers and fire hose are installed in and about the garage and shop at convenient points. Large storage sheds are maintained for the storage of all motor cars and trucks. A large service station is operated at one end of the storage sheds. Service may be had at this station at any time of the day or night. Each car or truck placed in storage at night is carefully serviced by the station operator with gas, oil and water. The tires are tested and properly inflated.

Should the service man find any trouble in a car or truck he repairs it if it is of a minor nature. If he finds serious trouble he makes a duplicate report of it, one copy being placed on the foreman's desk and the duplicate copy being attached to the steering wheel of the car involved, with instructions to the driver to report to the foreman upon his arrival. Should the case require immediate attention, the garage foreman is notified by telephone and a mechanic dispatched to correct the trouble.

At all points in the garage shops and storage sheds compressed air is piped and hoses are attached for convenience. A steam cleaning and paint removing rack is also maintained. This is in operation during the evening and night hours in order that equipment requiring cleaning may be thoroughly washed up for the next day's service. At this place cars are also prepared for painting. A trim shop with complete equipment and stock is maintained, likewise a complete paint and varnish department.

Inspection Methods

Motor car inspection must be consistently followed up by prompt repairing. The real sources of trouble must be discovered if maximum efficiency at a minimum cost is to be obtained. We have found in practice that the most satisfactory method of inspecting equipment, especially in the outlying districts, is to have a qualified mechanic to make all minor repairs, such as valve grinding, adjusting bearings, and replacing minor parts, at that point on the system where the car or truck is in service. This means both a saving in time and money. These mechanics report all trouble direct, by private telephone, to the garage foreman who in turn issues instructions for the type and kind of repairs which shall be made.

At present we are using two such inspectors, one in the northern and one in the southern division. These inspectors are capable of calling upon each district at least once every 15 days, which we find sufficiently soon to take care of all pressing needs. These inspectors also report all cases in which equipment is being abused, such as fast driving, overloading or otherwise. Should trouble occur requiring immediate attention at some point at which an inspector is not obtainable, a mechanic is then dispatched from the central garage to take care of that particular trouble. These district inspectors are from time to time called to the central garage. At such times the foreman checks their previous reports and instructs them in proper methods of repair and servicing, as well as talking over with them any new developments in the motor industry.

We have had this method of inspection for approximately two years and have gradually improved it to raise its efficiency to the highest degree.

Methods of inspection at the central garage are somewhat different from those of the traveling inspector or mechanic, in that the garage foreman personally meets every driver of company equipment and discusses with him in detail the cause of his trouble. The foreman then issues what is known as a shop order upon which may be found a list of items which will practically cover the complete operations necessary for the complete overhauling of the car or truck. This shop order is so arranged that each repair made by the mechanic may be checked on the margin. Upon completion of the job the mechanic signs his name at the bottom of the order and returns it to the foreman with notations of any additional work he may have found necessary.

These forms are then filed for future reference, the original copies having gone to the main office in company with the daily time card, in order that a complete check of all work can be had. A space under "remarks" is provided at the bottom of these work orders in order that the foreman may issue special instructions to the mechanic when needed.

The foreman now carefully checks the car as to workmanship, general condition and operation in order that the smallest detail may not be overlooked, after which the car is turned over to the car dispatcher whose duty it is to return the car to its point of service and make the necessary records. At all times when repairs are being made, the foreman follows the work as done by the mechanic, instructing him as to the proper or best methods to use as well as to the type and kind of repair that should be made. The foreman must also check the car while it is in the shop as to its requirements in top and curtain repairs and note the condition of the paint.

Top and curtain repairs are made in our own trim shop while the car is in the repair shop proper. In this way there is no delay and a complete job is assured. Should the car have made so much mileage or be in such a condition that repairs seem hardly worth while, the foreman then looks up its record in a record book, compiled by the accounting department, which gives the cost of maintenance, and all other cost details on each car in the system. Should this cost be great enough to prohibit further expenditures other than of a minor nature upon the car, the foreman then consults the transportation superintendent. He reviews the matter and makes the necessary arrangements for the sale or disposal of the car, in trade or otherwise, for new equipment.

Trouble-Shooting

Trouble-shooting to us means determining the cause of faults and what the faults may be. This in the districts falls upon the traveling inspector in co-operation with the foreman by telephone. The inspector gives the foreman a complete statement of appearances and conditions of the particular car in trouble. The foreman then seeks to determine by analysis or a check of past trouble, the fault which presumably causes the trouble being experienced in that particular car. Should the fault be one of careless lubrication, neglect or improper care, he then reports the case to the transportation superintendent who in turn takes it up with the district manager, the object being to prevent such occurrences in the future. If the trouble experienced is of a major nature, and is due to improper care, a punishment is decided upon for the person driving the vehicle.

In cases of trouble which are brought to the central garage, the foreman arrives at the cause of trouble by direct conversation with the driver and then gives proper instructions to the mechanic for its correction. The above methods have been found very practical and agreeable to all parties and have enabled us to make a great saving in equipment, time and money.

The mechanical devices for trouble-shooting which we are using consist of detectimeters for coil and condenser trouble, Portastats for resistance tests on batteries, wiring, etc., and compression meters for ring and valve troubles.

Painting and Paint Shop Equipment

A painting department for a public service corporation garage is very necessary if appearance of company equipment is to be maintained at that high standard demanded by the public. Therefore, we have done much experimenting in order to determine which are then best of the various paints, enamels and varnishes available, and what are the best methods of application, in order to determine which pay the largest dividends in service.

We have found that Fords require an altogether different treatment from other makes of cars. We first tried repainting Ford cars with one and two spray coats of auto enamel. But after these cars had been in service from two weeks to two months, checking and fading would be evident with the result that the car looked practically as bad as ever. We then tried the use of one spray coat and one coat of varnish with the same result. We found this checking and fading was due to the fact that the regular standard factory paint job did not have a sufficient base.

Therefore, we decided to experiment in paint removing. This we did by trying out various solutions, under different condition, on the old paint. These solutions consisted mainly of caustics. After much experimenting along this line, we found that a solution composed of 6 lb. of Babbitts lye, 2 qt. of ammonia, ½ lb. of corn starch, 5 lb. of commercial wyandott, mixed with 12 gal. of water and heated to a temperature of 210 deg. F. and applied hot to the paint by means of a gravity feed and a hose, gave quite satisfactory results when allowed to stand from 10 to 15 minutes before applying the steam, as used in car washing. This would cause the paint and defective enamel to slide entirely off the body, leaving a nice, clean surface. We then placed the car in the paint shop where it was given, by means of the paint spray, two coats of quick drying auto enamel.

This method of procedure made it possible to have the car again in service within three or four days, and cars painted in this manner have been in service from eight to ten months and still show no signs of fading or deterioration.

Larger cars have been painted with standard coach paints, varnishes or are lacquered according to the class of work for which they are to be used. Lacquer as applied with a spray, although at a slightly higher cost, has given us considerably more service and appears to be far more economical in the long run. This is especially true in view of the fact that a complete repaint job is not necessary at the time the removal of paint is desired, for a rub down, with one applica-

tion of lacquer again places the care in service for as long a time as the original complete lacquer job.

Painting in this shop is not limited to motor cars alone. All trucks are painted here also. In painting trucks we have adopted a standard truck color of what might be called a dark brown. This color apparently maintains its appearance over a greater period of time, under all conditions, without renewal. Our method of application consists of first giving the truck a primer coat of lead and oil, after which it is rubbed down roughly and two coats of flat color applied by means of an air brush. After this it is given a coat of varnish. At the same time in which our cars or trucks are repainted, we also redress the tops and side curtains if necessary. By following this method we have been able to secure twice the life from the average top at but small cost.

However, it is well to consider that not all painting methods or kinds of paint will work equally well in all parts of the country, owing to differences in climatic conditions. There is much room left for experimenting along these lines, therefore.

Transportation Education

In the following series of papers the authors have endeavored to advance some measures of value toward more efficient handling of transportation equipment.

Educational Methods

Before attempting to train shop men, the machine shop arrangement, tool equipment, etc., should always be carefully scrutinized, checked and care taken to see that it is in the best possible condition to give the best results. Shop men should be given every opportunity to develop and advance themselves in their work. Men who cannot do this must be ultimately replaced with men who can. A shop organization should always be well balanced as between very expert high-priced mechanics, ordinary mechanics and apprentices of varying degrees of ability. By doing this we are assured over a period of years of having at all times a competent force.

Chauffeurs and truck drivers must be fit physically and steady and alert mentally. They must always be courteous, efficient and at the same time bear before them the mottoes "Safety First" and "The load must go through."

Safety Training

In education for the prevention of accidents, the first step is a campaign in first aid education, the second step is the institution of a safety first campaign and the third elimination of unsafe conditions. At the start of a safety first campaign one of the hardest things to do is to train men to protect themselves from the results of their own carelessness. At times drastic measures are necessary in order to attain this end. A first aid campaign and a safety first campaign carried through and backed by the management will work wonders in reducing accidents, promoting good feeling amongst the employees and preventing in many cases what would otherwise be human wreckage as the results of industrial accidents.

Training of Shopmen

By W. H. FAIRBANKS and D. A. RUNYARD

Before the training of shopmen is considered the machine shop should be carefully observed. A light, well ventilated, orderly and clean shop is necessary in order to turn out accurate and fast work. Shop equipment should be conveniently located so as to save time for the workmen. Constructive suggestions from the mechanics should be given attention and changes made where they will prove of mutual benefit. Employees will more readily co-operate with the management where they are provided with satisfactory working conditions.

The shop tools must be kept in repair and in place. It is advantageous to select some member of the shop organization whose duty it is to see that this equipment is returned when borrowed and who will take care of any equipment that needs repair. The foreman may interchange the members of the organization

to good advantage and give them all a chance to be custodian of the equipment. This procedure gives everyone an opportunity to see the importance of returning borrowed equipment. It is impractical for the company to furnish hand tools for the employees. Care should be exercised on the part of the foreman to see that each employee supplies himself with the necessary tools which will enable him to carry out his work.

It should be made clear to all new employees that they must co-operate with their fellow workers as well as with the management. If harmony does not exist in the organization then the brakes are applied to the wheels of progress. Employees who are willing to co-operate are ready to fit into any training or betterment program that the management may have in mind. Employees who are willing to do whatever is necessary generally find plenty to do between jobs and in the end they are benefiting themselves. It is up to the foreman to find the willing spirit in his man if it is to be found. But when a willing attitude is lacking there is no denying that the man is not fitted for that particular class of work.

Owing to the class of work a mechanic has to perform he should not be temperamental. Unfortunately he frequently is. The everyday discouragements in a machine shop, when parts do not fit and things are generally wrong, should not daunt a mechanic's spirit or temper. He must be courageous. He must not easily be discouraged. In order to turn out the right class of work he must be resourceful, exact, and energetic. The foreman having the foregoing ideals in mind will do what he can to see that the members of the shop organization are kept in a good frame of mind, and that no unnecessary irritations are inflicted. Rules and regulations should be minimized. Rules pertaining to the safety of workmen should comprise the bulk of the shop regulations.

The Misfits

A mechanic who cannot assume responsibilities around a machine shop is a misfit. If he has not enough confidence in his work to be responsible for its exactness and completeness, then he is doing work which is far over his head. It would be the proper procedure to send such a man down the ranks and let him do such work as he is fitted to do until he realizes that he must assume responsibilities in order to raise his position. A man in this class may be a hard worker at routine tasks but lacking in confidence in himself. A talk with such a man, showing him his weakness, would not be amiss. He may appreciate the interest taken in him and strive to overcome his fault. Periodical interviews and assignments of responsibilities should be given such an employee. If the habit of shifting responsibilities prevails in the shop, then a service card which identifies the work done should be initiated by each mechanic. This will permanently do away with the shifting of responsibility and raise the standard of the work.

Dependable employees are very valuable assets to any organization. We are striving to create more dependable employees so that the general efficiency can reach a higher standard. Employees that one can trust to turn out perfect work, work where nothing is left undone, are not to be found wanting jobs. It is our problem, therefore, to train the employees if we expect a high standard of efficiency. Advancement awaits the employee who makes the best of his opportunities, and prepares himself for a better job. Praises may remain unsung for the good work a man performs but no one can take from him any credit that rightfully belongs to him.

An Individual Problem

Little can be said regarding any set standard for the training of shop men. There are many ways to raise the standard of an organization. It remains an individual problem owing to the diversified conditions existing in various organizations. What may be needed in one case might be superfluous in another. In this article I have attempted to bring together facts generally known to be essential to good organization.

Men selected for work in a machine shop, skilled or unskilled mechanics, should be clear thinking, broad-minded, and should possess both vision and the other

qualifications as previously outlined. In building up a permanent force, care should always be exercised to keep it a balanced force; that is to say, to build up your force so that the apprentice of today will be the skilled man in the following years. Training is now simplified because we have selected the best of material with which to work.

Weekly Meetings

Weekly meetings held in the machine shop for the purpose of promoting efficiency are sometimes beneficial. These meetings should include all shop employees. New methods, instruction and many other subjects can be brought to everyone's attention at such a time. Work that has been completed and not done correctly can be brought forth so that a similar mistake will not be repeated and more care will be given to all future work. Constructive suggestions should be asked for from each member present and anything that anyone is in doubt about or not satisfied with, can be cleared up and not left in his mind to breed discontent.

Criticisms should be made to employees by the foreman in a private discussion and not taken up at the general meeting, except in a general way, merely calling to everyone's attention the fact that certain work was not perfect. Of course he must not identify the work with any particular member of the group.

Special work can be assigned and rotated at intervals among members of the organization. Special work may consist of checking motors, steering apparatus, brakes, etc. These assignments in connection with the regular work tend to make specialists and give everyone a complete knowledge of the various parts of an automobile. The added responsibility is beneficial, and when the assignments have been rotated and the cycle completed, the foreman will be able to select specialty men. Those not performing their assignments correctly will stay on the same plane until they raise their standards. Those who cannot raise their standards will eventually be replaced.

The assignment of other special work of a permanent nature in connection with the regular mechanical work can be made. In this class come tire repairing, battery work, welding, lathe work, tool and material custodianship. Men doing such work are, in the final analysis, specialists.

A school of instruction on mechanical subjects may prove helpful to mechanic helpers and others desiring knowledge to enable them to advance. If a night shift is not run, these schools can best be conducted evenings in the machine shop, where equipment is always available.

Many plans for training might be suggested here, yet the proof of any plan is the results which it will create. The management must set a high standard to work to and then assist the employees in every possible way to attain that standard.

Training and Selection of Drivers

By W. H. FAIRBANKS and D. A. RUNYARD

The question of training and selecting drivers for motor vehicles is one to which we believe not enough thought is given ordinarily. Practically anybody nowadays can drive an automobile. For this reason there is a tendency to minimize the qualifications which a successful chauffeur or successful truck driver should have. Basically the qualifications for chauffeur or successful truck driver should have. Basically the qualifications for chauffeur or truck driver are about the same, but the two jobs demand men of different temperament and physiques.

The basic thing in selecting men for either kind of job is that they be steady and alert mentally and fit physically. Young men are on some accounts preferable to older men, but when young men are employed, married men are usually preferable to single men on account of their more steady habits.

As regards physical condition, some companies go so far as to have all prospective motor vehicle operators examined by a competent physician to determine if their eyesight, hearing and heart action are all right. This physician's examination to some

may seem unnecessary, but on the other hand it is pretty easy to picture what an accident might occur if an operator's vision was badly impaired or if the operator was to have an attack of heart failure while at the wheel of his vehicle.

All operators should have somewhat more than a superficial knowledge of the mechanics of their units and should be competent to care for minor and roadside repairs. The more competent the operators are mechanically, the better service they will get from their vehicles and this in turn will materially reduce operating costs.

Passenger Vehicle Drivers

Operators of passenger vehicles should be neat and clean in personal appearance and must appreciate the fact that one of their chief duties is to do all they can to add to the convenience and comfort of their passengers. Courtesy at all times is absolutely necessary, but chauffeurs must also remember that they are the skilled men responsible for the safety both of the passengers and of the motor equipment. This latter thought applies particularly to those cases in which passengers have real or imaginary appointments to keep and urge the driver to take chances which in the driver's judgment should not be taken. Under these conditions the driver must possess both executive and diplomatic qualifications which will make him master of the situation without arousing resentment on the part of the passengers.

Truck Drivers

As regards truck drivers, we have always believed there is a tendency on the part of some employers to minimize the responsibilities which these men carry. They do not appreciate the really tremendous potential possibilities for damage which the man at the wheel of a truck carries with him. A heavy duty truck, laden to capacity, will weigh gross anywhere from 10 to 12 tons. Such a unit is a literal juggernaut of death unless properly handled and controlled. As a consequence, the responsibilities which the drivers of heavy duty trucks carry are very real and are something which the driver himself must appreciate. These responsibilities are something which the management should appreciate also.

One of the biggest points in handling heavy duty equipment lies in the fact that while we know we can get any speed we want with the use of compounds and gear ratios, practically nothing as yet has been devised for quick deceleration of high speed. The engine is the best brake which the truck driver can have, but here again the driver must be thoroughly trained so as to know how to use his engine and must never taken chances. Nothing is more dangerous than the practice some drivers indulge in occasionally, that of coasting down hill with the gears in mesh and the clutch out, then attempting to decelerate the truck by slipping in the clutch. Sometimes the truck's mechanism will stand this, but usually everything lets go. Even if no one is hurt we have an attendant repair bill of anywhere from \$600 to \$1,000.

Another big point to be remembered in picking truck drivers is that from the minute the driver leaves his headquarters with his load, to all practical purposes he is a non-supervised employee. It should be remembered too that our companies are gauged in the eyes of the general public by whatever attitude our drivers assume. If our drivers hog the road and hog the crossings, as so many are inclined to do, and can do with safety to themselves, the public will at once judge our company to be that kind of an organization.

In addition to this, if incompetent or insufficiently instructed drivers are put on the road and have frequent road breakdowns which they are unable to handle, there is always the attendant loss of time and money to their companies. The railroads of the United States in selecting and training engineers always stress the point that the engineer is the sole custodian of thousands of dollars worth of equipment and of any number of lives. We believe this point should be realized amongst motor vehicle operators, too.

The two slogans which we believe every motor vehicle operator should always keep before him are "Safety First," and "The load must go through."

Education and Prevention of Accidents

By W. H. FAIRBANKS and D. A. RUNYARD

The subject of education and prevention of accidents covers a broad field. We, of this section, are naturally particularly interested in the prevention of shop and transportation accidents. However, rather than discuss this particular phase of accident prevention, we have thought that it might be of more interest to the members of this section if we were to tell them of the campaign, along general accident prevention lines, which member companies L and M, together with their associated companies, throughout the United States, have been going through for the past two or three years.

Accidents in industry may be viewed from two different angles; one angle being the humanitarian side, and the other angle being the cold blooded point of view of loss in efficiency and dollars wasted. From whichever angle it is viewed, the subject of accident prevention is recognized as a subject well worth the most careful consideration and action. The companies referred to have recognized this and attacked the problem from two separate angles, namely, education of employee personnel in first aid methods, and education in safety first measures to reduce accidents.

The first aid campaign was started first and was followed very closely by the safety first campaign. In general, these campaigns were handled as follows:

First Aid Campaign

At all of the larger centers certain employees were picked out and, on company time and at company expense, were given a course in first aid training which lasted about a week. After the completion of this course, they were given an examination and, if successful in passing the examination, were awarded an American Red Cross certificate of proficiency. These men then returned to their individual locations, whereupon each man at once proceeded to organize a class in first aid training. The classes numbered from 15 to 20 men per class.

These classes covered about 10 lessons and were held after working hours on the employees' time. As fast as one class completed its work another was formed. Interest and enthusiasm were encouraged and stimulated by means of first aid contests between teams representing various localities, these contests being sponsored by the company and much interest being aroused in them. For the first year or so of this first aid educational campaign, enrollment in the classes was voluntary and no particular steps were taken to force employees to take this work. As the situation developed and as new employees were gradually added, these companies have practically made it a condition to employment that each employee must agree to take this first aid training.

Safety First Campaign

The safety first campaign was started very shortly after the inception of the first aid campaign and interest was stimulated by handling it largely as a competition between various localities, districts, divisions and companies. All accidents were divided into two classes, the first known as disability accidents, where time was lost from the job, and no-disability accidents, these latter being minor accidents with no lost time. The standing of the various communities, districts, divisions, etc., was gauged by their number of lost time accidents. A chart was published in the company's house organ showing where each major subdivision stood as compared with the other subdivisions. This campaign was actively assisted by the company. One of the first steps taken was the elimination of all unsafe conditions which could be found.

To aid in the study of these conditions, safety first committees were formed among the employees. These committees were charged with the duty of reporting to their supervisors any unsafe conditions which existed in the plant.

The history of these safety committees is somewhat interesting. All of the men on the committees took an intense interest in their work and very many valuable suggestions were received from them, these suggestions many times covering unsafe conditions which the supervisors had overlooked. After a period of time, however, the bulk of these unsafe conditions were cleaned up and from then on the committees were forced to pick on any little thing they might see. As a rule these little things were only a question of judgment with nothing vital involved. This situation in time led to the doing away with the safety committees. The good which these committees accomplished while in existence was very real and very marked.

Another very interesting thing which this safety campaign developed was the fact that one of the hardest things we have to do is to try to protect men from the results of their own carelessness. All accidents are carefully analyzed and, so far as is humanly possible, the blame is placed where it belongs; that is, on the employee injured, on fellow employees, on the company, or on some occasions on just plain hard luck. At the start of the campaign, and one or two other occasions, somewhat drastic action was necessary to impress on the employee the need for carefulness. One such instance occurred in my own department and I believe it is worth repeating.

About two years ago the disability or lost time accident record for my department looked rotten. We were running from 8 to 12 lost time accidents per month despite all preachments and precautions. I waited until an accident occurred which seemed to me a clean cut case of one in which men were hurt from their own carelessness. When this accident did occur the men were sent first to the doctor and then to the hospital. The doctor bills and the hospital bills were paid for them in full and they were paid full wages for all the time they were off on account of their injuries. After these men were fully recovered and had returned to duty, I discharged them for the carelessness which had resulted in the accident. The men naturally thought they were terribly mistreated, demanded an investigation from my superiors and asked for re-instatement. There were, of course, certain features in favor of their contention that they had been unjustly laid off but throughout the entire investigation I stood fast on the ground that I was going to stop accidents from carelessness, no matter what it cost. When the smoke of the investigation finally died away, the men still re-

mained discharged, and since then the disability lost time accidents of my department have dropped from 8 to 12 per month to from 0 to 2 per month and have remained there ever since.

Auto Accident Prevention

As regards education and prevention of accidents in handling automobiles, one excellent system is that which provides that every accident be carefully investigated by a chief special agent's office, or some office independent of the operating departments, and a report made to the department head as to who is at fault in the accident. Member company M operates under such a system and I run in my office, for my personal information, a card file covering every employee in my department who has ever had an accident, a record of the accident, and whether or not the employee was at fault. I have never directly said anything on this but it is generally understood among all drivers that wherever a man's card comes to show too many accidents with the record showing him at fault, he automatically discharges himself. This is so generally understood that our avoidable accidents are very few and far between.

Another excellent measure to discourage automobile accidents is to refuse to "square" traffic tags and to have it a generally understood rule that all employees who get traffic tags must care for them personally. There are, of course, some instances where the driver will receive a tag on account of solid tires bumping or not enough rubber on solid tires. Cases like this are not, of course, the driver's fault, and we take care of the tag for him. Under practically all other conditions, we do not attempt to handle tags.

The first aid campaign and safety first campaign being carried on by member companies L and M has been under way about three years and has achieved really marvelous results. The present percentage of disability accidents is only something like twenty-five per cent of what it was when this campaign started. From a humanitarian point of view much pain and suffering has been saved to the individual employees and their families. From the cold blooded business point of view, the loss in efficiency and dollars wasted due to accidents has been greatly cut and best of all it is apparent to all of us that the individual employees are much more contented when working under the safety first plan. Another very interesting thing is that while the working out of this scheme of course has cost something in time and thought, the actual efficiency of our forces has been increased and really somewhat speeded up rather than slowed down.

Public Relations Section Report

Customer-Ownership Committee Report*

Past, Present and Future of Customer-Ownership Activities on Pacific Coast

The committee on customer ownership has prepared as its report for the past year a brief resume of the customer ownership plan as pursued by the power companies of the Pacific Coast, with a few suggestions as to its promotion and the general lines of policy that should be followed.

The customer ownership plan of marketing junior securities had its inception in June, 1914, when the

Pacific Gas and Electric Company offered its preferred stock for sale direct to the public. The plan met with immediate favor among small investors, particularly among customers and employees. Gradually it was adopted by other utility companies on the coast until at the end of 1925, practically all of the utility companies were using this means of placing a substantial portion of their junior securities.

A prominent economist has said: "The forms which ownership of property takes in any society are of fundamental importance in determining its social and economic institutions."

Our American social and economic institutions represent the highest development of civilization. They are the inspiration of our forms of property ownership, if we are to accept the economist's conclusion as a truism, and they have been from the beginning constantly subject to change as there have come about changes in those forms. Basic laws are, of course, inflexible, but new interpretations must be

*F. V. Boller, San Joaquin Light & Power Corporation, Chairman. R. H. Seward, Great Western Power Company. W. H. Kamm, Coast Counties Gas & Electric Company. H. E. North, Western States Gas & Electric Company. K. G. Couthie, Coast Valleys Gas & Electric Company. E. B. Criddle, The Southern Sierras Power Company. F. E. Seaver, Los Angeles Gas & Electric Corporation. F. L. Greenhouse, Southern California Edison Company. E. J. Beckett, Pacific Gas and Electric Company. D. G. Tyree, California Oregon Power Company. M. B. Fowler, San Diego Consolidated Gas & Electric Company.

given them from time to time, they must have new application, and there must be deeper understanding of them to make changing conditions of society conform.

Economic Revolution in Progress

Commenting recently upon a sign he had seen displayed by a Western city, inviting the public to become partners in the ownership of a certain utility, Albert W. Atwood, widely known as a writer on business and economic topics, said that it is perhaps true that we are passing through a swift, silent, peaceful and unheralded revolution. Behind this revolution stands the diffusion of ownership and equalization of wealth which the spread of securities of corporate industries among the citizens at large is bringing.

"So rapidly and quietly has the change come about," says Mr. Atwood, "that those who still prate about the rich growing richer and the poor growing poorer are talking about conditions which are fast passing, and exhibiting a state of mind which is largely a hang-over from earlier times."

Even more recently, in an article on Customer Ownership appearing in the *New York Commercial*, A. Emory Wishon of California, chairman of the National Electric Light Association's Customer-Ownership Committee, said:

"After all, customer ownership is a logical development of the times. This is a period of co-operation, of mergers, and of recognition of the folly of waste and wasteful competition and of the superior efficiencies and economies brought about through business combinations. Modern life is too complex, its problems are too involved for the average individual to stand alone to meet them. Hence the average individual of necessity goes along with its fellows, joining in such business partnerships as are safe and sound. He is merely playing his part in the great business movement of his day."

Diffuse Ownership Created

Obviously there has come in recent years through customer ownership a change in the form of property ownership—the wider diffusion of ownership discussed by Mr. Atwood. And while that change has brought with it the millions of the masses to help in the developing of American business, it has also brought to business the opportunity to give to the masses a better understanding of its purposes, its policies, and its sincere desire to serve.

The sale of securities to the public, our customers and employees, has assumed as its angle of chief value the promotion of better public relations. The first and all time purpose in the sale of securities was to obtain money for betterment expenditures. Now, however, while we recognize that a vast reservoir of capital has been made available to us, the better public relations with the public through the intimate and understanding contacts customer ownership has created, have made its financing aspect relatively much less important.

Until quite recently, the growth of industrial capital was confined to increasing the holdings in the possession of comparatively few men, but since we have begun to recognize the virtue in the movement of joint stock ownership, participated in by small investors, business, which includes public utilities, seems inclined to foster and further this popular financing principle. This change in the mode of financing was actuated by the belief that greater success will be achieved by the business that finds among the users of its products, the greatest number of its shareholders.

Sales Effort Less Active

A study of reports received from utility companies would indicate that there has been, particularly among companies throughout the East and Middle West, a recent tendency to depart from the customer-ownership plan. Although the utility companies of the West have adhered much more closely to the plan, the reports show that the increase in the amount of securities sold and number of new stockholders obtained by some of the companies has not maintained the same percentage as shown during the first few years of their stock sales activities.

This slackening of effort, we believe, is logically due to the fact that money has been plentiful and large blocks of securities could be marketed in a short length of time by placing them through the bond houses. Some of the companies, having construction programs that did not require large sums of new money, sold out their issues during the first few months of the year. During the remaining months they attempted little or no customer ownership promotion.

Uniform Accounting

Reports received from the various companies show rather wide variations in the costs of stock sales. It is thought that this variation in costs can be attributed to the lack of a uniform method of accounting in connection with stock sales activities, and it is the suggestion of your committee that such a uniform method be adopted, in order that these various costs may be intelligently studied by member companies.

Use of National Association Files

It is suggested that member companies make more use of the customer ownership files kept by the National Section in New York. These files contain much valuable data, gathered by the National secretary and available to any of the member companies.

Replies to Inquiries

The executives of the stock sales department of the various companies are continually being called upon for statistics and asked to fill out questionnaires. It is the committee's suggestion that the various companies submit, semiannually or annually, the data which are now furnished the National Section yearly through their stock sales questionnaire, and that all inquiries for these data should be referred to the national headquarters.

Selling Methods

Various methods of selling on the customer ownership plan have been tried out by the different companies, but it is the consensus of opinion among those companies whose activities have been most marked along these lines, that the greatest success can be achieved through a combination of employee salesman and professional salesmen.

Keeping in Touch with Stockholders

It does not seem to be a uniform practice among the companies to keep stockholders advised as to the activities of the company, and it is suggested that the stockholder list affords an excellent opportunity to further public relations by the publication of a bulletin, either monthly or quarterly, in which information as to the utility's construction programs, etc., would be set forth.

Refunds for Installment Buyers

It is recommended that companies should make it as easy as possible for stockholders purchasing small lots on the installment plan, to obtain refunds, either partial or whole, and either by re-sale or otherwise, in case such a necessity should arise. A great many small stockholders consider the purchase of utility securities in the nature of a savings account, to be drawn upon in emergency, and if we are to continue to build up our Customer Ownership list from the ranks of the small investors, serious thought must be given to this phase of the relationship.

The Ten Cardinal Rules

Attention is drawn to the "Ten Cardinal Rules of Customer Ownership," prepared by the customer ownership committee of the National Section in its report for the year 1925. These rules embody the fundamental principles of customer ownership policy and promotion, evolved after careful study and embodying the analytical opinions of outstanding leaders of the industry. They are sufficiently general in their scope to permit each individual company to meet its particular problems under them, and sufficiently specific to serve as a guide to successful operation of the Customer Ownership plan.

Statistical Report

The reports received by the committee do not contain a complete record of all the activities of all the companies but as an indication at least of what has been done by some of the larger companies of the West under the customer ownership plan, the following figures are submitted:

Name	Number Stockholders	Par Value
Los Angeles Gas & Electric Corp.....	10,321	\$ 19,220,700
Pacific Gas and Electric Co.....	39,592	51,000,000
Great Western Power Co.....	9,265	13,027,000
Southern California Edison Co.....	83,000	85,910,200
San Joaquin Light & Power Corp.....	12,350	11,878,900
	154,528	\$181,036,800

Advertising-Publicity Section Reports

Book of Standards*

Organization, Scope, Functions and Purpose of the Section

Part I—Organization and Procedure

A—Purpose

The Advertising-Publicity Section is dedicated to the study of advertising and publicity matters as related either individually or co-operatively to all members and member companies of the Pacific Coast Electrical Association.

This study shall be directed to the end that such advertising and publicity efforts shall be of the greatest benefit individually to member companies and mutually to all branches of the industry.

Nor shall this study or activity be limited to any particular type of advertising or publicity effort, but shall include a study and activity in all phases of such publicity and advertising effort as may be found helpful.

This section shall strive to improve the technique of advertising copy by this study. It also shall seek to advance its usefulness.

Likewise the section shall set forth the ethical principles which shall guide members of this section in their advertising and publicity practices.

B—Scope

The advertising and publicity study and activity of this section shall be conducted not only upon commercial advertising, but upon institutional, public relations, financial or any other forms of advertising or publicity engaged in by member companies. All legitimate forms of advertising or publicity also shall be sought for and developed.

While not interfering with the advertising study or programs of other sections of the association, this section shall place itself at the disposal of those sections that may carry out for them or assist in their advertising and publicity efforts, lending to those sections the experience and fitness of the membership of this section for such works.

It is to be hoped that other sections of the association will avail themselves of the Advertising-Publicity Section's co-operation. Logically, this section should be the clearing house for all such activity within the association.

C—Membership

Any member of the Pacific Coast Electrical Association whose duties in whole or in part give him responsibility in the advertising or publicity activities of his company may become a member of this section.

Space will be provided upon the membership application form of the Pacific Coast Electrical Association giving the applicant an opportunity to signify his desire to belong to the Advertising-Publicity Section.

Committee and department personnel may be made up from a list of members assigned as belonging to this section and furnished by the secretary of the association.

It is desirable that the activities of the section be engaged in by as many members as possible. Also it is desirable that the work of the section be so distributed that too great a burden may not be placed upon any few members, nor that all opportunities

for self-expression be given to only a few members who have proved good workers in the past.

Variety and freshness of viewpoint are such valuable attributes in the performance of this section's activity that every effort to stimulate these qualities should be encouraged by a widespread assignment of papers, problems and labors among the membership.

D—Officers

Selection.—The officers of this section shall consist of a chairman, a vice-chairman and a secretary.

The chairman shall be selected according to the rules and practices of the Pacific Coast Electrical Association, whatever they may be.

The vice-chairman and secretary shall be appointed by the chairman.

Duties.—The chairman shall preside at meetings and be responsible generally for the conduct of the section during the period of his incumbency. He shall act upon the executive committee for one year after his chairmanship ceases.

The vice-chairman shall assist the chairman whenever required and in the absence of the chairman preside over meetings in his stead.

The secretary shall keep the minutes of the section and attend to such correspondence or other clerical or detail duties as concern the section. He shall furnish also to those members to whom a copy of this Book of Standards has been assigned an account of the minutes of each meeting, prepared in loose-leaf form to conform with the style of the Book of Standards. These he shall dispatch as soon after the meeting as possible that these reports may be kept for reference by members at all times.

E—Standing Committees

To carry on the administrative functions of the section there shall be three standing committees as follows:

1. Executive committee.
2. Standards committee.
3. Information committee.

These committees shall be organized as outlined in paragraphs following.

1—Executive Committee.

Personnel.—This committee shall consist of the chairman, the vice-chairman, and the retiring chairman of the section. The latter shall bring to this group the experience gained in the activity of the past year's administration in order that the current year's work of the section may be in conformity with, and supplemental and continuous to previous work of the section.

Duties.—It shall be this committee's duty to consider and to take action upon all executive functions of the section.

Powers.—It shall set in motion whatever section motions or resolutions are considered by it as valid, or which, submitted to the standards committee, shall be found to conform with section standards.

It must decide upon action of any nature as recommended by either the membership at large or by the standards committee.

It shall review the year's program and assign the study and activity of the section for the year as described in section F of this manual.

2—Standards Committee.

Personnel.—This committee shall consist of three members, the junior member to be appointed each

*Prepared by the Standards Committee. B. S. Allen, Key System Transit Company, chairman. Journal of Electricity: W. A. Cyr. Pacific Gas and Electric Company: J. C. Jordan.

year by the executive committee to serve a term of three years. The senior member shall serve as chairman of this committee.

Duties.—The standards committee shall constitute a judiciary body, responsible for the establishment and the interpretation of the standards of practice of the section.

Any changes or additions to the code of standards shall be submitted to it for decision as to conformity with the ethical principles set forth by the section. The standards committee shall have no executive power, but shall make whatever recommendations it deems advisable to the executive committee or to the membership at large for their action.

The standards committee shall remain always an advisory body.

Media.—Media of questionable merit submitted to the individual members of this section or to member companies, and yet upon which the member may not desire to disapprove upon his own responsibility may be submitted to the standards committee for examination and recommendation.

An examination then shall be made by the standards committee into the value of such media according to the standards set forth in Part II of this manual. The standards committee in such cases will examine into the merits of the medium presented, its circulation, field, influence, class and policy and submit a report upon it to the member or members affected by it.

Action upon such a report then shall be left to the discretion of the member who has submitted the medium for report.

In a similar manner the publisher of a periodical or special edition, if he feels that his publication is worthy of advertising patronage, may submit it to the standards committee for examination. Upon such publication a similar report will be made to the members or member companies which may be interested in such a decision.

It then shall rest within the discretion of those members whether or not such media shall be used, the standards committee's recommendation being designed as a guide to such final action.

The standards committee in all respects shall contribute an impartial judgment, unbiased and uninfluenced by local conditions.

Manual.—The standards committee shall be responsible for the upkeep of this Book of Standards, furnishing revised pages as they become necessary to those to whom books are assigned in each member group or member company.

3—Information Committee.

Personnel.—The information committee shall consist of a chairman, appointed by the executive committee, who shall in turn appoint such members as he requires to carry on the work of his committee. This committee personnel shall be so arranged as to provide a member of the committee in each population center to whom local inquiries for information may be submitted.

Duties.—This committee shall be charged with responsibility of having available to whoever may desire it such information concerning the industry as may be called for.

To this end the committee shall have a representative in each natural center of population who shall be responsible to the committee and to whom requests for information may be directed. Presumably such representative shall be with the local central station company.

If these representatives, after diligent thought and careful research through all the means at their hands, cannot supply the desired information they shall refer the request promptly to the committee chairman, who may enlist the assistance of any or all members to furnish the required information.

Speakers.—This committee also shall be prepared to furnish speakers on subjects dealing with the industry, at the request of responsible individuals or public groups. Information for these speakers or for other speakers who may request such information material also shall be furnished by the committee.

This committee, in short, shall strive to be of assistance to all member companies in a proper collection, co-ordination and dissemination of information.

F—Work of the Section

1—Departmental.

Departmentalization.—At the beginning of the term or at any occasion which may require such action the executive committee shall create departments to conduct the research work of the section for the year. The leadership of such departments shall be assigned to some particular individual member considered by the executive committee as being best fitted to undertake the task. He shall be known as the department editor, responsible for the presentation to the section of a careful analysis of that particular study to which he has been assigned. The department itself shall be made up of the editor and such other members of the section as he may name to assist him.

The work of a department shall consist of gathering together information and preparing a report upon the subject assigned to it at the specified time set by the executive committee.

For purposes of concentration it is considered advisable that the number of these departments be limited.

Department Meeting.—Each department shall be made responsible for a program of study at one of the regular meetings of the section.

At its particular meeting the department shall strive to present to the assembly something in the nature of a symposium on the subject assigned to the department. Papers prepared by individual members of the department may be read. In many cases speakers from outside the section or even outside the association, but competent to present some particular phase of the department study, may be heard. Indeed this practice should be encouraged since it should lead to a broadened viewpoint as to the particular subject under discussion.

It should be the aim of each department to bring before the membership at its particular meeting as completely exhaustive a survey of the subject as possible. Each phase of the department's assigned topic should be dealt with intelligently and thoroughly to the end that the membership may gain from these programs the greatest potential knowledge and usefulness.

Annual Reports.—Each department editor then shall be charged with the responsibility of summarizing and editing the best thoughts and practical ideas presented in his program, this summary to constitute the serial report of his department to the section. These reports then shall be in the form required for publication in the annual proceedings of the association. They also shall be available to the section chairman for summary or special mention in his report to the association on the activities of the Advertising-Publicity Section for the year.

Dismissal.—Upon satisfactorily completing its program and report to the section, the department shall be dismissed and its work considered finished. In those instances in which departmental study should be carried over from one year to the next the executive committee of each new year shall departmentalize the work anew, possibly retaining the entire department personnel of a previous administration or at least some of its most active members; at least those who are best acquainted with the previous study and hence in a more logical position to carry it on advantageously.

2—Annual Report.

Form.—The particular form in which the annual report of the section to the association shall be presented at one of the general sessions of the association annual convention shall be decided upon by the executive committee.

In general it shall consist of a summary of the work of the standing committees and of each of the departments, such particularly interesting features of the latter as seem vital to an understand-

ing by the entire association to be given prominence as pleases the chairman.

Supplementary.—Whenever possible the section shall strive to present at the convention, aside from and supplementary to the annual report, either a paper, speaker or display of some effective character. This paper or display should be decided upon by the executive committee and arranged for as early in the year as convenient to allow ample time for its preparation.

3—The Book of Standards.

Form.—The Book of Standards shall be prepared in a loose-leaf binder of letter size. The binder shall be of black, limp, grained leather. Upon the outside front cover of the binder the words, "Book of Standards, Advertising-Publicity Section, Pacific Coast Electrical Association," shall be embossed. The name of the member company to which each copy is assigned also shall be embossed on the cover.

The pages containing Parts I and II of this manual shall be of a good grade of bond stock, and of appropriate size. The content of the book shall be printed. A separate page shall be given each item so that changes may be made without rendering obsolete the entire book, merely the page affected being removed.

Preparation and Upkeep.—The standards committee shall be responsible for the preparation, editing and upkeep of pages for the Book of Standards, furnishing new pages to holders of copies of the manual whenever some change in it is authorized by the executive committee or membership.

Assignment.—One copy of this Book of Standards shall be prepared for each member company of the Pacific Coast Electrical Association. The secretary of the section shall keep a record of those to whom copies of the manual have been issued.

Other copies may be secured by members or member companies upon proper request. The member shall furnish his own binder, the section furnishing the pages therefor.

Minutes.—Minutes of the meetings of the section shall be prepared by the secretary of the section to be incorporated in the Book of Standards, Part III. Minutes shall be prepared by mimeograph or other suitable process, and on paper punched to fit the binder adopted.

Use of Book.—The Book of Standards shall be kept at hand by the advertising and publicity representatives of member companies for ready reference. The book is designed as a useful tool for the member and should not be filed in the library or other repository of records and forgotten. It should prove especially useful for reference in cases of solicitation for special editions or other irregular media. It may be used to demonstrate the stand of the industry upon questions relating to truth in advertising and honesty in merchandising, and should be used in this manner by members at every opportunity.

Except that it is used, all efforts to produce it and to maintain it will become wasted and unproductive effort and such is diametrically opposed to the spirit in which it is issued.

G—Procedure

1—Regular Meetings.

Regular meetings of this section shall be divided into a business session and a department-program session, as described in Section F 1 of this report.

Business Session.—The business session shall be held for the purpose of considering any business matters, preliminary reports, or reports of standing or special committees, passing of resolutions, or other activities as may be necessary to the conduct of the section.

The order of business shall be:

1. Meeting shall be called to order by chairman. The secretary shall check the roll of those present.
2. Reading of the minutes of the previous session by the secretary followed by a discussion and disposition of the minutes.
3. Introduction of new members and guests.
4. Reports of the standing committees:
 - a. Executive
 - b. Standards
 - c. Information.

5. Reports of special committees or preliminary reports from departmental editors.
6. New or old business and the disposition of it.
7. Announcements.
8. Determination of the next meeting place and date.
9. Adjournment until the department program session.

Department Program Session.—These sessions, after being called to order by the section chairman, shall be turned over to and shall be in charge of the department editor. He shall announce the subject for the presentation of which his department is responsible and summarize the work of the department on the subject.

He then shall announce and present each speaker in turn and at the conclusion of each paper or address strive to show how the thoughts presented bear upon the subject under discussion and a solution of its particular problem. He may call upon members present for informal discussion of any particular phase of the subject presented.

At the conclusion of his program the department editor shall turn the meeting back to the section chairman for such action upon that which has been presented as may seem fitting or necessary.

2—Executive Committee Meetings.

Executive committee meetings may be called at the option of the section chairman. This committee shall have the power to act for the section upon any matters upon which the members of the committee are in accord.

3—Standards Committee Meetings.

Meetings of this committee may be called at the option of the chairman or upon direction either from the membership of the section or from the executive committee.

Likewise these meetings shall be informal and conducted in such manner as will promote most effectively the work to be considered; yet they shall be made as convenient as possible for all members of the committee with respect to their regular work.

When a medium is presented for judgment, members and member companies or other reliable sources of information concerning the medium shall be enlisted to provide as clear and unbiased an understanding of the case as is practicable. This work of investigating any particular medium may be undertaken by one of the members of the committee who shall report his findings to the combined committee for its final report.

At the Convention

At least one session shall be requested by the section from the convention program committee. If necessary more than one session may be asked for, according to the subjects to be considered. These sessions shall be conducted as open meetings. In many cases indeed it may be deemed advisable by the executive committee to hold the convention meetings as departmental program meetings, presenting some particularly important topic for the symposium at the convention session so that delegates to the convention may avail themselves of the opportunity to hear such a problem discussed from all of its angles.

Part II—Standards of Practice

I—Truth in Advertising

This section subscribes heartily to the principles set forth by the Advertising Clubs of the World with respect to truth in advertising.

Although these principles have been given expression in many instances, there seems to be no definitely stated code setting them forth. The cardinal principle enunciated is that all advertising and merchandising shall be truthful.

However, these principles as applicable to our industry and taken from the program of the Better Business Bureau of the Advertising Clubs of the World, may be expressed as follows:

Code.—In the conduct of their several advertising, merchandising and publicity efforts members of this association, and particularly this Advertising-Publicity Section, shall:

Urge the public to investigate before investing, and to investigate before signing agreements.

Protect the buying public against deception and possible fraud in advertising and merchandising by investigating and correcting wrong practices.

Persuade individual firms to discontinue unfair tactics that work to the disadvantage of competitors and which, moreover, tend to throw the industry into disrepute.

Remove unjustified suspicion and misunderstanding between competitors by getting the facts regarding suspected advertising and merchandising practices and reporting upon their real character.

Increase loyalty and spirit of employees of member companies by having them know that this industry is participating in the "truth in advertising" movement.

Help an advertiser to make his printed announcements more believable and productive, and in all cases strive to turn unscrupulous advertisers into fair dealing advertisers.

Co-operate with honest business institutions to help them remove confidence-destroying spots in their own advertising and merchandising.

Reduce the burden of unjustified public suspicion which through misunderstanding may react upon the advertising or merchandising of any institution.

Increase public confidence in all advertising and merchandising by co-operating with the advertiser to represent correctly his goods and the conditions under which they are sold.

Protect public confidence in member-companies' individual business communities as reliable trade centers so that buyers in the surrounding territories may feel that they get value received in those communities.

Seek to create maximum public confidence in every recognized form of advertising; out-of-doors as well as newspaper, magazine, direct-mail, etc.; by making all member companies' advertising trustworthy.

Seek to conserve the efficiency of employees in member companies by investigating promotion schemes in which such employees are solicited to buy stock or merchandise through the misuse of advertising or through misrepresentation.

Promote state and municipal legislation for the better protection of legitimate business and the public from abuses in advertising, but, when flagrant misuses of advertising must be prosecuted, use legal action only as a last resort after all efforts to educate have failed.

Favor making adjustments with purchasers dissatisfied by reason of unfortunate experiences with advertised goods or service, at the same time taking advantage of the opportunity to educate the erring advertiser to better methods and to impress on the individual customer, if possible, the integrity of most business concerns.

Take the steps necessary to protect the public and legitimate financial institutions from fraudulent stock promotions, conserving money in legitimate business channels in the interest of business generally and maintaining the confidence of the public in the advertising of worthy investment securities, especially those of public utilities.

II—Special Editions

This section condemns the practice of patronizing special editions, special advertising pages, annuals, programs, commercial house organs, association publications, novelties or other forms of irregular or unorganized advertising or publicity. This section also favors the practice of supporting associations or organizations by memberships or by specific contributions, when warranted, rather than by asking those members responsible for advertising placement to give support to such institutions by advertising patronage which lays them open to solicitations from every source.

This section prefers to advertise regularly and methodically through such organized and stabilized media as its appropriations for advertising will permit.

The resolution adopted by this section on this subject is as follows:

Resolution Condemning Special Advertising Pages and Editions

Inasmuch as there has arisen a growing tendency among newspapers and periodicals to publish special advertising pages and editions on nominal pretexts; and furthermore,

Inasmuch as these special pages and editions are of small advertising value and are a heavy drain upon funds which otherwise would be used in profitable, organized advertising effort; and furthermore,

Inasmuch as solicitations for the sale of space in these special pages and editions very generally are conducted by irresponsible persons with only temporary connections with the publishers they represent and along very irregular lines, often using assumed sales as arguments and the established commercial relations of their prospects as a means of compelling the purchase of space; and furthermore,

Inasmuch as cases have been cited where established commercial relations of great importance have been endangered by the methods used by special-page or edition salesmen soliciting our own members; therefore

Be it resolved: That this Advertising-Publicity Section of the Pacific Coast Electrical Association hereby condemns the practice of publication of special pages or editions which are dependent upon the sale of special one-time advertising space; and furthermore,

Be it resolved: That this Advertising Section of the Pacific Coast Electrical Association hereby also condemns the practice of employing special solicitors for the purpose of selling or promoting special pages or editions and who care little for the general welfare of the paper represented and less for the interests of the prospective space buyer; and furthermore,

Be it resolved: That, since this Advertising Section has an established standards committee whose duties call for the investigation and analysis of advertising media, members of this section may submit to the standards committee any medium of a special character for examination by the standards committee, which committee shall value impartially the worth of such media and make appropriate recommendations for the guidance of the membership in each case.

Art in Electrical Advertising

By S. W. GREEN*

Man's first written language was in pictures. Written words were developed only after ages of tedious toil by people who used conventionalized pictures to form letters.

While modern thought owes much to written language the shortest appeal to all minds is through a picture. Pictures are impressive because they are primitive. The wide appeal of the motion picture today is only mankind's reversion to his primitive love of pictures. Pictures convey thought messages with the least mental exertion.

Because of the tremendous power of the picture in thought impression and transmission there is every argument for the fullest use of picturized illustration in advertising the electrical industry.

Electricity is the newest force to be brought under control by mankind. Into its discovery and development is woven a new romance that surpasses the wildest dreams of the ancient romancers. It is a part of all that is new and active in our everyday life. During the few years of its development and use it has wrought wonders far greater than have taken place in all time past. It has opened up new possibilities of achievement for those who are ambitious, those who desire to do big things; it has lifted the loads from the shoulders of millions of toilers; it has made possible undreamed of forms of entertainment and recreation. It has shortened time, made seconds valuable, speeded up our old world. It is the most potent force for the benefit of mankind that ever has been devised.

With so much to be said about electricity and its uses and so little time in which to say it there arises the necessity of telling the story in pictures.

But what kind of pictures?

As well ask the virtuoso what kind of tone must he use to lure a sonata from his Stradivarius.

Use the picture that tells the story, whether it be a bent line to show rising costs, or a full-color masterpiece to depict a drama. Only the experience of the trained artist can guide in the proper selection of illustrations.

Little is left to be desired in modern art. Behind is the gradual development of art sense that has grown with civilization. Modern inventive genius has provided means for the reproduction of pictures that are practically without limitations in conveying every stroke of the artist's brush, every shadow of the camera.

But one thing is necessary for effective art, that is the idea or thought behind it. Give ten thoughts to the picture to one for the text and you increase your attention value a hundredfold.

* Department Editor, Advertising-Publicity Section, P.C.E.A.

IDEAS FOR THE CONTRACTOR

Country Club Has Unique Electric Installation

Electric Air-Heating Throughout, Kitchen with Electric Ranges, Are Features of Modern Clubhouse

Probably one of the most complete electrically equipped clubhouses has been completed at Hacienda del Orinda, 10½ miles from Oakland, Calif. It is a unique creation in country clubs. It is heated electrically throughout, and the kitchen and grill are equipped with electric ranges and broilers. The water is heated electrically, and electricity also performs many other tasks.

The building has been planned carefully to serve the members of the club with the greatest possible efficiency. The main floor contains a spacious lounge. On either side of this are the dining room and the library. The veranda is completely enclosed and extends the entire length of these three

rooms. It also will serve as a supplementary dining room. The office and check rooms are across from the dining room.

The pantry and kitchen are located at the end of the dining room. Although the men's grill adjoins them, it is completely equipped to render service independently of the kitchen.

The mezzanine floor is devoted to the convenience of the ladies. It includes a lounge room, locker and dressing rooms. The second floor is divided into living rooms, each equipped with bath.

The lockers and showers occupy what is known as the basement, although it is on a level with one of the entrances. The sub-basement is used by

the golf professional and the caddy master. It also houses the refrigerating plant, the heating plant and storage rooms.

The electric installation is a notable one where comfort and convenience were paramount and economy was essential. The development of electric devices and the extension of electric transmission lines have made the use of electricity universal, gradually supplanting every other form of energy. This condition is exemplified well in the Orinda Country Club.

Engineers of the Magnavox Company of Oakland determined the size and location of the air heaters used. Electric heating installations always should be so planned that ample heat always will be available. The theory underlying the use of air-circulation heaters is based on the assumption that a room will be warmed quickly with full heat. After this condition is obtained the heat will be maintained





Electric broiler, two ranges and baking oven included as part of the equipment in the kitchen.



The men's grill is completely equipped to render service independently of the kitchen. A portion of the electric equipment.

at a uniform temperature by a reduction in the amount of heat applied. This is a more economical method of heating than the installation of heaters of a smaller capacity, necessitating their being on high-heat position at all times.

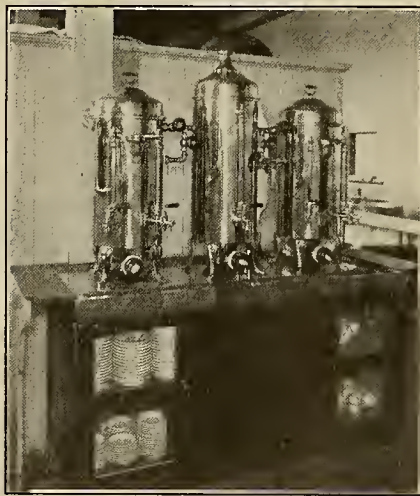
In determining the heating equipment for any installation many conditions should be considered by the engineer or contractor including the location, the construction of the house or building, whether or not the foundation will be open or closed, the amount of glass exposed to the outside and the location of this glass. A complete heating installation which will be satisfactory should be made and not a makeshift job. This is a problem with which every electrical contractor should be familiar.

Magnaray electric air heaters are used throughout the installation. The majority of them are 5-kw. portable air-circulation type heaters. The bedrooms are equipped with 2-kw. heaters of this type while the bathrooms contain 1,000-watt insert radiant-type heaters. In the locker rooms a 1,000-watt insert radiant-type heater is installed at the end of each row of lockers. These heaters are designed to provide localized warmth for a comparatively short length of time while a person is dressing. Each heater is controlled separately and can be turned on or off at the pleasure of the guest. This provision eliminates the necessity of keeping the entire locker room at a moderate temperature at all times. Several air-circulation type heaters of 5-kw. capacity are used to take the chill from the air in the room.

The water is heated with three Westinghouse water heaters interconnected with a garbage incinerator to a 500-gal. storage tank. A central electric refrigeration plant supplies refrigeration for all purposes. From this central plant brine is pumped to several refrigerator boxes and ice cream cabinets located in the kitchen and the grill. In addition to this, there is a large meat refrigeration box, and provision also is made for freezing some blocks of ice. The equipment was manufactured by the Brunswick-Kroe-

schell Ice Machine Company, and the boxes and cabinets were made by the Coast Refrigeration Company.

Modern electric equipment makes the large kitchen a model of cleanliness and service. The Westinghouse cooking equipment includes a 12-kw. broiler, two 24-kw. ranges, and a 3.5-kw. baking oven with Tycos temperature control. Provided opposite this equipment is a 14-kw. steam table manufactured by the Montague Range and Furnace Company, San Francisco.



Coffee for the guests of the Orinda Country Club is cooked on these electric urns. An electric warming oven immediately below the urns keeps the cups and saucers warm at all times.

Three large T. J. Tupper Company coffee urns, totaling 4 kw., equipped with a warming oven, supply an adequate quantity of this beverage for the club. A Surgex dishwasher, a Hobart dough mixer, and a 5.5-kw. Toastmaster complete the electric equipment in the kitchen. The kitchen contains two large refrigerator boxes and an ice cream cabinet, while the meat refrigerator adjoins it.

Electrical equipment in the men's grill includes griddle, hotplates, waffle iron, steam table, warming ovens, toaster, drink mixer, orange crusher, refrigerator box and ice cream cabinet.

All electrical equipment is on one master meter in order that advantage may be taken of the lowest possible electric rate. In order to do this it was necessary to install an 800-amp. 230-volt main switch.

Hamilton Murdock, Oakland, was the architect. The electric wiring was installed by the Scott-Buttner Electric Company of that city.

National Handbook for Wiremen Serves Practical Man

The theory and practice of electrical construction have been so modified and improved in the last few years that it is incumbent upon the electrical man to provide himself with the most complete and approved data if he would make a safe and acceptable installation. This material has been collected by Rollin Smith of Los Angeles and published as the National Handbook for Wiremen. The price of the book is \$3.

The book is based on: The National Electrical Safety Code of the Bureau of Standards; The National Electrical Code of the National Board of Fire Underwriters; The Standards of the Underwriters' Laboratories; and the Electrical Safety Orders of the Industrial Accident Commission of California.

The publication is dedicated to the California Association of Electrical Inspectors as a contribution to its work in standardizing methods of electrical construction and in adding to the knowledge of electrical men.

An advisory council for the publication was composed of the following men:

H. N. Beecher, chief electrical inspector, Los Angeles Department of Electricity; F. A. Short, electrical engineer, Safety Electric Products Company, Inc.; J. H. Pengilly, electrical engineer, Brown & Pengilly, Inc.; R. H. Cates, power engineer, Southern California Edison Company; Otto Weimer, electrical engineer, Los Angeles Department of Electricity; C. W. Mitchell, electrical engineer, Board of Fire Underwriters of the Pacific; R. J. Larrabee, assistant electrical engineer, Underwriters' Laboratories; G. E. Kimball, electrical engineer, Industrial Accident Commission of the State of California; George W. Stirton, electrical engineer; William A. Spalding, retired editor; James H. Howard, electrical engineer; W. F. Alston, architectural engineer; Joseph H. Coburn, electrical engineer, and Dr. H. Wellington Taylor, illuminating engineer.

NEWS OF THE INDUSTRY

Water and Power Act to Reappear on California Ballot

Definite assurance that the Water and Power Act, without change in form or wording, will reappear on the ballot at the November biennial election this year, was given recently by Franklin Hichborn, of the California State Water and Power League. The Water and Power Act initiative was then in the hands of the attorney general's office for titling.

Mr. Hichborn gave the assurance that the only changes in the present Water and Power Act over that of previous years might be in the numbering of the measure upon the ballot.

First submitted to the voters in 1922, the Water and Power Act, which proposes the issuance of \$500,000,000 of bonds for the development of water and power resources by the state, was turned down by a majority of more than 353,000 votes. Resubmitted in identically the same form in 1924, the measure again was defeated, the majority being over 432,000 votes. It now is proposed to bring the twice defeated initiative bill before the voters again in identically the same form in November.

During the past two campaigns the chief sponsor of the measure was reported to be Rudolph Spreckels, and it is understood that he will give the measure its chief support again.

Full text of the Water and Power Act was published in the *Journal of Electricity* Sept. 1, 1924, p. 177. With the exception of title to the act, which may be changed in the 1926 edition of it, the assurance given was that the wording of the present initiative proposal would be identical with that of 1924.

Decision Authorizes East Bay District as "Municipality"

Although applications for the development of power in connection with its Mokelumne project have been withheld temporarily, the East Bay municipal Utilities District, comprising the communities of the East Bay region of San Francisco Bay, was given a decision by the Division of Water Rights of the California Department of Public Works recently that establishes the district as a "municipality" within the meaning of the Water Commission Act.

The Division of Water Rights ruled that the application of the district was an application by a municipality within the meaning of the term "municipality" as used in Section 20 of the Water Commission Act and that the Act contemplates a preferred priority for an application by a municipality for its general municipal uses as well as for only domestic purposes of its inhabitants, and consequently that the application of the district was

entitled to a priority over the pending applications of J. W. Preston, Jr., Stephen E. Kieffer and all other pending non-municipal applications on the Mokelumne River. Recommendations for final action were forwarded to the Federal Power Commission.

On May 1 J. W. Preston, Jr., filed suit in the superior court at Jackson, Amador County, against the department of public works of the State of California, division of water rights, W. F. McClure, director of public works; Edward Hyatt, Jr., chief of the division of water rights; and the East Bay Municipal Utilities District. The suit seeks to have the court reverse or modify the action of the defendants, other than the East Bay Municipal Utilities District, by either denying a permit to the district or issuing the permit subject and in subordination to the prior right of the plaintiff under the prior applications.

Utah Town Plans New Street-Lighting Installation.—The town of Vernal, Utah, has approved plans for the installation of a new street lighting system, to be installed early this summer.

Re-argument of Herminghaus Case Set for July 26

Arguments in the appeal before the Supreme Court of California against the injunction handed down by the Fresno County superior court in the Herminghaus suit against the Southern California Edison Company will be reopened July 26, 1926, according to announcement from the court. The decision of the lower court enjoins the Edison company from storing water in Huntington Lake on its Big Creek project except that which is produced by the run-off in the Huntington Lake basin. (*Journal of Electricity*, March 1, 1925, p. 185.)

The case was argued before the State Supreme court in January of this year, and briefs were filed by power and irrigation interests as well as by the Federal Power Commission, the state division of engineering and irrigation and the state division of water rights. (*Journal of Electricity*, Jan. 15, 1926, p. 66.) Decision by the court was held up once until additional briefs were filed, and the present announcement that the case will be reopened for further argument will delay the final decision until late summer.

Linemen Work in Danger Zone at \$15,000,000 Oil Tank Fire

Linemen employed by the Midland Counties Public Service Corporation played a romantic role when a river of blazing oil from the Union Oil Company's big storage tank farm near San Luis Obispo, Calif., ignited by lightning on April 7, ran toward the sea, endangering the power company's pole line. The men were forced to do their work, that of tying back the lines, within 100 feet of the flowing inferno, which followed a creek bed down a narrow valley. The fire, burning in the huge reservoirs and tanks for nearly a week, consumed 6,000,000 barrels of oil, causing a loss to the oil company and insurance companies of approximately \$15,000,000.



Linemen tying back lines within 100 ft. of river of burning oil at recent San Luis Obispo oil fire

Northwestern Electric Company Starts New Indoor Substation.—A 3,000-kw., automatic indoor substation has been commenced by the Northwestern Electric Company, Portland, at East 32d and Weidler Streets. This location is in the midst of one of the residential districts of the city, and the building is designed architecturally to harmonize with its surroundings. It will be faced with red brick and trimmed in gray stone, and the ground around it will be landscaped elaborately. This marks a change in policy as to substations of this class, former ones having been of the outdoor type. The design allows for a possible doubling of the capacity in the future.

Irrigation-Reclamation Committee Reports Favorably on Swing-Johnson Bill

Washington Correspondence

A favorable report on the Swing-Johnson Bill has been made to the Senate by the Committee on Irrigation and Reclamation.

The bill in the form in which it now is pending on the Senate calendar provides for a dam at Boulder or Black Canyon on the lower Colorado River; for the construction of an All-American Canal for the delivery of water to the Imperial Valley, and for a power plant.

Secretary Mellon's suggestions for the financing of the project are embodied in the bill. A Boulder Canyon fund is set up in the treasury. The Secretary of the Treasury is authorized to advance to the fund up to \$125,000,000, from which interest payments are to be deducted. The interest during the construction period will amount to nearly \$21,000,000.

The Secretary of the Interior is authorized to make contracts for the sale of power at the switchboard and for water for irrigation and domestic uses. The dam and works are to remain the property of the government, even after they are paid for by the beneficiaries.

Contracts for power are limited to fifty years. Renewals are to be made

as provided in the Water Power Act. Conflicting applications also are to be handled along the lines of the Water Power Act. Small agencies are to be permitted to share in the use of transmission lines. The secretary, in his discretion, may lease the privilege of using the water discharged at the dam.

An extended minority report was filed by Senator Ashurst of Arizona, who declares the purpose of the bill is to coerce that state.

He further declares that a high dam at Boulder will prevent the development of the maximum resources of the stream and declares it to be abysmal folly to use 200,000 firm horsepower in the eternal task of raising water 1,730 ft. for use in southern California, when adequate supplies can be obtained at no greater cost by diverting the water at Bridge Canyon. That dam with another at Glen Canyon, he claims, would allow the maximum use of the waters of the river.

President Coolidge personally has given assurance of his support of the bill to Representative Smith, chairman of the House Committee on Irrigation and Reclamation, and to Representatives Swing and Sinnott.

Ratification of Colorado River Compact Urged by Secretary Work

Speaking before the Los Angeles Chamber of Commerce at a luncheon April 26, Hubert Work, Secretary of the Interior, urged the speedy ratification of the pending Colorado River compact.

"It will make for a just division of the Colorado River waters between the upper and lower states and bring to an end a threatened and costly interstate rivalry," he declared.

"The necessity for an early settlement of the respective rights of the different states and two nations in this river and in the carrying out of the proposed development on the lower portion of the stream, is vital," Secretary Work continued. "The potential benefits to be derived from this development are of great national interest and importance. It is, therefore, of the greatest importance that agreed upon facts in connection with this Colorado River development be set properly before Congress, as a national undertaking, so that suspicion may be avoided that its purpose is for personal promotion or local development only.

"It is my belief that as soon as the Boulder Dam legislation has been approved by Congress the applications for private power development should have immediate consideration. There does not seem to be any danger that the power market will be over-supplied. On the contrary, cheap power will help to open up new mines, promote the building of new railroads and multiply industries.

"The proposed project, in its engineering phases, is the greatest work of its kind in the world," he said.

"Its magnitude will challenge the talent of the country's ablest engineers. As designed, it will contain 3,375,000 cu.yd. of concrete, or three times that of the Assouan Dam of Egypt, which is the greatest masonry dam ever built.

"If an organized corporation, competent and willing to develop this project in its several ramifications, will come forward and submit a contract to build these structures and place their operation under such control of the government as will protect the many and diversified interests involved, the Secretary of the Interior will recommend to Congress that such proposition be sympathetically entertained."

Referring to Arizona's failure to ratify the Colorado compact, Secretary Work said:

"The Colorado River compact is being resisted by a state that could profit by this comprehensive development. Manoeuvring for individual or corporate advantage is being resorted to by those speculating in hope, but it is confusing the main issue."

Puget Sound Company to Erect Building.—The Puget Sound Power & Light Company, Seattle, has purchased nine lots at Eighth Avenue North, between Roy and Aloha Streets, comprising 62,640 sq.ft., for a consideration of \$80,000. On this property the company plans to erect a building to house quarters for linemen, warehouse space for materials, rest rooms, assembly room and large garage. The structure will be one-story, reinforced concrete, 116x315 ft.

Power Project to Be Commenced at Lewiston, Idaho

Contract for construction of a dam, forebay dyke and power house at Lewiston, Idaho, a power project which is a part of a joint timber development plan in which the Weyerhaeuser interests and the Northern Pacific and Union Pacific Railways are identified, has been awarded to Winston Bros. of Minneapolis. The entire project will cost more than \$13,000,000, of which \$2,000,000 will be expended on the power development. The contractors are expected to start work in May and to have the dam completed by May 1, 1927.

The railroads are engaged in building a 41-mile branch line and the Weyerhaeuser company is building a lumber mill adjoining the power site. The timber company is under contract to furnish 200,000,000 ft. of timber annually to the railroads when the project is completed.

Black Eagle Falls Plant Started by Montana Power Company

Work has been started by the Montana Power Company upon a new 25,000-hp. hydroelectric generating station at Black Eagle Falls on the Missouri River, near Great Falls, Mont. The new station will replace an obsolete power plant built in 1890 to supply the Boston & Montana smelter. The estimated cost of the new installation is \$1,000,000.

The plant will utilize a drop in the river at this point of 25 ft. through three propeller-type vertical turbines. These turbines will be the largest of this type to be installed up to the present time. In reconstructing the present timber crib dam, provisions will be made for the passing of 100,000 sec.-ft. of flood waters, the maximum to be recorded at this point. Adequate water is assured for the plant on account of other hydro developments higher up on the Missouri and Madison Rivers.

Present plans call for the completion of the development in the summer of 1927.

Five Are Killed as Bucks Creek Tunnel Caves In

Working at the face of the heading of the tunnel being driven to connect the waters of Bucks Creek with those of Grizzly Creek on the Feather River Power Company's Bucks Creek hydroelectric project, six men were imprisoned when tunnel timbering was crushed and 42 ft. of the tunnel adjacent to the heading collapsed April 17.

Further slipping of heavy ground hampered the work of rescue crews, working at top speed to reach the men. The crews worked in short relays and with every means at their command sought to remove the imprisoned men alive. They succeeded in reaching and bringing out alive one of the men, sixty-eight hours after the cave-in. A few hours later the bodies of the other five were found.

The tunnel is being driven by crews under the subcontractors, Dardier & Richardson, San Francisco. It is 7 ft. wide and 8 ft. high, and had been driven to a length of 136 ft. when the collapse occurred.

Valuation of Colorado Utility's Property Well Under Way

Valuation of the property of the Public Service Company of Colorado in Denver by representatives of the city under the direction of H. B. Dwight, engineer of the Colorado Public Utilities Commission, is actively under way. Inasmuch as the present franchise expires May 15, city and company officials agree that it is absolutely impossible to submit the measure to a vote of the people before that date and consequently an ordinance now is being prepared in which present rates and relationships are to be continued indefinitely and until the new franchise is denied or approved.

In the meantime an unfortunate situation has been injected into the franchise matter, it is reported, through the action of a small group of voters whereby a petition establishing lower rates for both gas and electric service has been filed in legal fashion, and as a result of Denver's home rule charter provision this measure also must be submitted to a vote of the people at either a special or general election. Rates required by the petition represent approximately a fifty per cent reduction.

Aberdeen Rejects Stevens & Koon Report on Wynooche

Refusing to accept the findings of Stevens & Koon, consulting engineers, Portland, who were employed by the city of Aberdeen, Wash., to make an estimate of its water and power project on the Wynooche River, the city council of Aberdeen has approved the employment of W. J. Roberts, consulting engineer, Tacoma, to make a new report of the project. The council further agreed to delay for two weeks action on the ordinance proposing to submit to the voters a bond issue in the amount of \$2,000,000 to build the municipal power development on the Wynooche. In the meantime it appointed a committee, headed by S. C. Watkins, superintendent of water department, to take steps to acquire a dam site and impounding basin on the Wynooche for the commencement of the municipal water project for which \$700,000 in bonds have been voted.

The report of Stevens & Koon is one of a number of reports that have been made on the Wynooche project, and, incidentally, estimates the cost higher than any of its predecessors. The cost of the plant at the end of nine years, after which it is estimated the operating revenue will begin to produce a surplus instead of a deficit, is figured to be \$5,551,000. This allows for nearly \$1,000,000 over the actual cost to carry the plant through this development period.

The actual construction cost was placed at \$4,797,000, of which \$3,592,000 would be required for early construction on the plan recommended. This estimate includes dam, tunnel, 24,000-hp. power plant with a daily load factor of 48 per cent, 26-mile transmission line to Aberdeen, substation and 40 miles of distribution line in the city. It includes also a tie transmission line to the Cushman plant of the city of Tacoma, a distance of 23 miles, and allows \$100 per acre for clearing 2,600 acres of the storage

basin to make the water fit for the city water supply source.

Calling attention to the fact that the city would have to develop its power business in competition with a private company and that this development necessarily would be slow, the report recommends that the city defer construction of the Wynooche project as follows: it is suggested that the start should be made in a small way and continued until a power load has been developed; deferring the construction of the large hydroelectric plant until there is load enough in sight to warrant its development."

C.R.E.A. Will Hold Meeting in Santa Ana June 7

A statewide meeting of the California Committee on the Relation of Electricity to Agriculture will be held in the Ebell Clubhouse, Santa Ana, Calif., June 7, 1926, the day preceding the Pacific Coast Electrical Association Convention in Los Angeles. A noteworthy program has been arranged for the meeting which will interest all of those connected with the application of electricity to agriculture.

J. J. Duell of the Farm Bureau Federation will preside. Included among the speakers will be Roy Bishop, president Orange County Farm Bureau; L. J. Fletcher, chairman California Committee on the Relation of Electricity to Agriculture; W. S. Rosencrans, vice-president, California Farm Bureau Federation; Ezra Decoto, member of the State Railroad Commission; S. S. Knight, legislative representative, Farmers' Grange and Farmers' Union; A. Emory Wishon, vice-president and general manager, San Joaquin Light & Power Corporation.

All of those who are interested in this vital subject are invited to attend as no formal invitations will be issued.

Commission Extends Irrigation Rate Period in Utah

An order extending the period of time during which the Utah Power & Light Company's existing rates for irrigation pumping shall be effective has been issued by the Public Utilities Commission of Utah. The order was granted on petition of the Utah Lake Distributing Company and a stipulation between the power company and the water company in which the power company waived formalities.

The petition set forth the fact that in 1922 an order was granted because of the existence of an agricultural emergency, and declared that the same emergency continues to exist. The order of 1922 gave to the then existing irrigation customers of the power company power at the same rates effective prior to the advance granted by the commission in the power rate case.

Large Power Plant Planned for Nasel River, Wash.

Application for the appropriation of 670 sec.-ft. of water from the north branch of the Nasel River, flowing from Pacific County into the Pacific Ocean in the western part of Washington, has been made by Henry L. Gray of Seattle to the state supervisor of hydraulics at Olympia. The water will be used in the development of 10,000 hp., and plans include a dam 110 ft. high to impound 20,000 acre-ft. of water which will be conducted to the power house through a tunnel and pipe line 1,675 ft. long. The estimated cost of the project is set at \$1,500,000.

Another application made recently is that of the Royal Development Company of Leavenworth, Wash., which seeks an appropriation of 30 sec.-ft. of water from Phelps Creek, a tributary of the Chiwawa River. The power to be developed, 1,080 hp., is to be used entirely for mining purposes. The power house already has been built and the cost of completing the project is estimated at \$40,000.

Edward Fitzpatrick of Ovington, Clallam County, Wash., has applied for a 30-sec.-ft. appropriation from Sapoel Creek to generate approximately 3,600 hp. under a 1,200-ft. head. A timbered dam, 25 ft. high, is to be erected, and the cost of the project will be approximately \$50,000.

Another project in the same district, the extreme northwestern part of Washington, is that contemplated by W. E. Theodore of Seattle, who has asked for 20 sec.-ft. of water from Eagle Creek for the generation of 4,600 hp. under a 2,300-ft. head. A dam similar to that of the foregoing development is planned, and the estimated cost of the project will amount to \$45,000. Both projects are to be completed within three years.

Washington Utility Sells 9,036 Shares of Stock in 8 Days

In reopening its customer-ownership campaign at Spokane, Wash., The Washington Water Power Company met with unusual success in its efforts to place 15,000 shares of 6½ per cent cumulative preferred stock among its customers. In the first eight days of the new campaign a total of 741 customers and employees subscribed for 9,036 shares of stock, par value \$100, and made cash payments totaling \$500,669 against the aggregate par value of \$903,600. A limit of 25 shares to a customer was established.

The stock was sold through the company's department of public relations, of which W. H. Ude is director.

Extensive Improvements Planned in Yakima Valley, Wash., by Power Company.—The Pacific Power & Light Company of Yakima, Wash., plans extensive improvements in the Yakima Valley during the year. At the Naches plant a 400-ft. penstock is under construction; in Toppenish, a new substation is to be built with capacity of three times the present one, and is to be equipped with six 500-kw. transformers. The company will build immediately 2½ miles of line to supply the Harrah and Bench communities.

Make Reservations Promptly for Northwestern Convention

Plans for the annual convention of the Northwest Electric Light and Power Association, Spokane, Wash., June 14-17, are going forward but at the time of going to press are not advanced sufficiently so that a definite statement can be made as to the program. R. B. McElroy, chairman of the hotel reservation committee, has issued a request that reservations for rooms at the Davenport Hotel be made through him as early as possible. On account of the fact that other conventions are coming to Spokane at about the same time, accommodations may be available only if reserved well in advance.

Valuation Decision Reversed by Washington Court

Having the effect of reversing the order of the Washington Department of Public Works by which the rate base of the Pacific Power & Light Company, Portland, was reduced (Journal of Electricity, Jan. 15, 1926, p. 69), Judge John M. Wilson, of the Superior Court of Washington for Thurston County, has handed down a memorandum opinion declaring that the department could not make certain changes in the rate base which it had attempted to make. Conforming to this opinion, formal judgment will be entered remanding the case to the department for further action.

The case had been brought by the company following the department's order of Dec. 31, 1925, which reduced the value of the company's Yakima-Walla Walla, Wash., power system by \$1,137,244, basing such order on the evidence gathered prior to and at the hearing at Walla Walla in August, 1925. The largest item in the reduction was for certain generating and transmission property in Oregon, which it was contended had been included erroneously in the Washington rate base fixed by a previous order; and the cities of Yakima and Walla Walla and others bringing the original complaint had alleged "palpable error" in this connection. In the present case the company's claim alleged that no such error existed and that, according to the statute, the former order was conclusive except as to subsequent changes by additions and retirements. In the opinion handed down the court agreed with the company's contention as to the Oregon properties, stating that the original valuation order should stand conclusive until changed by a revaluation.

Following the opinion, H. C. Brodie, assistant attorney general, announced that the case would be appealed to the supreme court of the state.

Contract Let for Clearing Power-Line Right-of-Way.—The Northwestern Power Company recently has awarded contract for clearing 99 acres of right-of-way for a proposed power line along the banks of the Elwha River, near Port Angeles, Wash. The right-of-way will be 8 miles long.

Pacific Coast Electrical Association

Code of Standards Adopted by Advertising-Publicity Section

Approval of the organization and code of practice as set forth in its proposed "Book of Standards" was given the standards committee of the Advertising-Publicity Section, Pacific Coast Electrical Association, at the meeting of the Section in San Francisco, April 23. Dan L. Scott, Los Angeles Gas & Electric Corporation, chairman, presided.

The standards committee's report consisted of the proposed form of the Book of Standards, setting forth the scope, purposes and the administrative functions of the Section and formulating a code of procedure in advertising and publicity practice conforming with the "truth in advertising" movement of the Advertising Clubs of the World. Resolutions condemning the one-time special edition or special advertising page also were incorporated in it.

The report, as read by W. A. Cyr, Journal of Electricity, in the absence of Ben S. Allen, Key System Transit Company, chairman of the standards committee, was approved with minor modifications. The standards committee then was instructed to issue 100 copies of the book in loose-leaf form for the guidance of members. The content of the Book of Standards was ordered published as the Section's paper for the annual proceedings of the association.

The advertising display, to be shown at the convention in Los Angeles, was discussed, and suggestion made and accepted that a small display of general classes of advertising, made up from the best specimens furnished by all companies, be arranged for. Papers or topics to be discussed at the open meetings of the Section at the convention were decided upon, and the meeting adjourned to a buffet luncheon.

Tentative Program of P.C.E.A. Convention Is Given

According to reports, all major arrangements pertaining to the annual P.C.E.A. convention practically are completed. But few details remain yet to be finally settled to round out the plans for what promises to be one of the best conventions held so far.

The following program is presented as a tentative arrangement of the business and social meetings and indicates the thoroughness with which the program committee has solved its problem. It may be noted that sessions are so planned that all of the section delegates may attend all of the general sessions, thereby broadening their scope of contact with and understanding of the industry, and also attend the business sessions of their particular section.

Tentative Program

Monday, June 7.
Afternoon—Registration.
Evening—Dance.

Tuesday, June 8.
8:00 to 10:00 a.m.—Registration.
10:00 to 12:00 a.m.—Address of welcome.
Reports.
Announcements of committee chairmen.
12:15 p.m.—Luncheon.
2:00 p.m.—Parallel sessions of sections.
9:00 p.m.—Reception to president.
Formal dancing.

Wednesday, June 9.
9:00 to 12:00 a.m.—General session of all sections.
2:00 p.m.—Parallel sessions of sections.
9:00 to 12:00 p.m.—Informal dancing.

Thursday, June 10.
9:00 to 12:00 a.m.—Executive committee meeting.
General session.
Afternoon—Sports and ladies' entertainment.
9:00 to 12:00 p.m.—Informal dancing.

Friday, June 11.
9:00 to 12:00 a.m.—General session.
2:00 p.m.—General business conference.
7:00 p.m.—Annual banquet.



Biltmore Hotel, Los Angeles, convention headquarters.



News of the Electragists



Rocky Mountain Electrical Co-operative League Holds Annual Convention

Nearly two hundred members of the electrical industry, representing its various branches in Salt Lake City and adjacent territory, were in attendance at the fifth annual convention of the Rocky Mountain Electrical Co-operative League held at the Newhouse Hotel in Salt Lake City on April 7.

The afternoon session opened at 2:30 with Vice-President B. E. Rowley, manager of the Edison Electric Appliance Company's Salt Lake City branch, presiding.

T. T. Burton, city commissioner of Salt Lake City, spoke on the subject "Electrical Wiring as it Affects Public Safety." Mr. Burton, who is in charge of the city's public safety department, told of some of the activities of his department in recent surveys of electrical wiring conditions in the business section, and pointed out a number of instances where improvement in conditions could be brought about. He urged the electrical people and the league as an organization to assist the public officials in promoting the utmost safety possible in wiring conditions.

In the discussion which followed, H. M. Ferguson, manager of the Utah Power & Light Company's Salt Lake division; Charles J. Reading, of the city's electrical department; Walter S. Knight, fire chief; and W. A. Moser, manager of the Salt Lake City office of the Westinghouse Electric & Manufacturing Company, spoke, commenting on various phases of the problem.

F. D. Winegar, city electrical in-

spector, followed with a brief discussion of the question of safety in electrical wiring, pointing out the fact that there is a vast difference of opinion as to what constitutes hazards.

George R. Randall, president of the league, suggested that it is largely up to the electrical people themselves to determine the difference between good and bad jobs. He recommended that the members of the electrical industry now should adopt a more aggressive policy in assisting to improve conditions, and urged that whenever an electrical contractor's license is granted the recipient of such license should be required to show certain qualifications in his line of work.

The next speaker was George R. Randall, president of the Rocky Mountain Electrical Co-operative League. His subject was "League Activities—Past and Future." He emphasized the good work being accomplished by the Lighting Service Bureau, which he stated was clearly shown by marked increases in kilowatt-hour consumption as indicated by the records of the central station among its commercial lighting customers. A considerable portion of this increase, he said, undoubtedly was due to the activities of the Lighting Service Bureau. He called attention to the fact that of 330 lighting layout jobs planned by the bureau, 245, or 80 per cent, had been closed, with the result that all branches of the electrical industry received some benefit therefrom.

S. W. Bishop, executive manager of the Electrical League of Colorado, was the principal speaker of the evening. His subject was "Outlets for Outlets." Mr. Bishop stated that electrical leagues throughout the country are performing a remarkable work, providing one of the big solutions for the problems confronting the electrical industry today. He presented the following outline of activities in league work that have had a far-reaching effect in other parts of the country:

Serving the public as a bureau of electrical information.

The maintenance of a staff to work directly with architects, builders, owners, and others in advising on electrical installations in all types of buildings.

Working toward the continual improvement and enforcement of electric wiring rules.

Explaining, demonstrating and emphasizing the necessity and value of proper lighting.

Encouragement and co-ordination of electrical exhibits.

Establishment of electrical homes in the most advantageous places.

Development of teamwork throughout the industry by get-together meetings and other social activities.

The establishment of a consciousness in the mind of every electrical man in the community that he cannot be an ardent electrical advocate until he himself practices the precepts of the industry.

The education of the consumer to the value of the league and the whole-hearted willingness and ability of the industry which it represents.

In emphasizing the importance of adequacy of convenience outlets, Mr. Bishop quoted the following statement by O. H. Caldwell, editor of Electrical Merchandising:

Electrical articles are the only ones which cannot be taken home and put to use by the purchaser—when, where and as he pleases. What "good roads" mean to automobile sales,



Banquet held during the fifth annual convention of the Rocky Mountain Electrical Co-operative League in Salt Lake City.

adequate outlets mean to appliance sales. Appliance men's own interests lie, therefore, in getting more wiring per home in order to sell more appliances per home.

Edward H. Eardley, manager of the Eardley Electric Company of Salt Lake City, next spoke on the subject, "The Electrical Contractor's Problems." Mr. Eardley's paper included a discussion of the important position which the contractor holds in promoting the best interests of the electrical industry. Mr. Eardley urged the contractor to study his business. "When a man ceases to be a student," he said, "he ceases to be a teacher, and when he ceases to be a teacher he is not capable of knowing what is right with respect to his business, and then he ceases to be a business man."

Nearly two hundred guests assembled at the banquet in the evening in the ballroom of the Newhouse Hotel. George R. Randall presided, introducing J. A. Kahn, president of the Capital Electric Company of Salt Lake City, as toastmaster.

P. M. Parry, commercial manager of the Utah Power & Light Company, spoke briefly concerning the place which the central station fills in the league's activities. A. C. Cornell, manager of the Graybar Electric Company's Denver branch, and president of the Electrical League of Colorado, presented an interesting paper on the subject, "The Jobber's Viewpoint."

Mr. Bishop complimented the electrical people of the Intermountain territory served by the Utah Power & Light Company in regard to the world's record which this section enjoys in the annual kilowatt-hour consumption per capita.

In regard to methods of operation of leagues and specific activities, Mr. Bishop suggested the advisability of not giving too much pressure to one particular activity but getting the general idea over to the public by plenty of publicity; adequate electric wiring standards as reflected by electrical inspection codes; encouraging the giving of the best for the money so that the greatest service and economy will be had by the customer ten years from now; uniform electrical ordinances; considering the national code as a minimum for operation in any city; maximum of service to be had from cost of wiring. He pointed out also that the development of ordinances, codes, etc., is up to the people of the electrical industry.

The Red Seal plan was explained thoroughly by the speaker, and he recommended that it be included in the league's program. He also recommended seasonal campaigns such as Christmas window trimming, co-operative newspaper advertising during the Christmas season, Christmas Cheer week, and June Bride Week.

Mr. Bishop's address concluded the program of the most successful convention in the league's history.

Inspectors of Northwest to Meet in January, 1927.—The annual meeting of the Northwest Association of Electrical Inspectors will be held in Longview, Wash., Jan. 17-18, 1927. W. P. Weathers, vice-president of the association, is chairman of the convention committee.

Pasadena Electragists Sponsor Red Seal Meeting

A Red Seal meeting was held in Pasadena Friday evening, April 23, under the auspices of the Pasadena Electragists and the Southern California Edison Company. The Red Seal playlet, "Listen, George," written by Richard E. Smith of the Southern California Edison Company, was presented. The parts of George and Mabel were taken by Mr. and Mrs. Cyril Briggs, professionals, supported by H. W. Barnes, Pasadena electragist, in the part of Mr. Stewart, the electragist, and Miss Adele Blauvelt as Aunt Caroline. The play was ably presented and made a very good impression.

Short addresses were made by H. W. Gates of the Pasadena Realty Board; W. L. Frost, Southern California Edison Company; B. S. DeLanty, manager of the Pasadena municipal lighting plant; W. F. Brainerd of the California Electrical Bureau; and Edgar W. Maybury of Marston, Van Pelt & Maybury, architects of Pasadena. Mr. Maybury stated frankly that he had hesitated to speak at this meeting



The three graces at the convention of the California Association of Electrical Inspectors at San Diego, March 22-24. All of them were from THE VALLEY. Which valley? Ask Mr. Stitt. From left to right—H. W. Stitt, Fresno; Frank Morrell, Stockton; and Carl W. Beaton, Sacramento.

because he was not sure that he could indorse the Red Seal plan. However, after it had been thoroughly explained to him he stated that he was heartily in favor of the plan and would specify Red Seal in future residence jobs.

Seventy-five builders, architects and electrical men were present. While the Red Seal plan is just getting under way in Pasadena four houses already are being wired under it.

George D. F. Smith of the Smith Electric Company has announced its removal to 975 Howard Street, San Francisco. The new quarters provide double the floor space, and the company expects to expand its motor and fixture departments. The former location was at 50 Natoma Street.

Red Seal Plan Endorsed by Marin County Realty Board

A joint meeting between the Electrical Development League and the Real Estate Board, both of Marin County, Calif., held at Hotel Rafael recently, resulted in the wholehearted endorsement of the Red Seal plan by the realty board. The well attended meeting was presided over by Mayor Bowman of San Rafael, who is also president of the Real Estate Board.

C. Felix Butte, vice-president of the California Electragists and chairman of its Northern Division, and Victor Hartley, executive secretary California Electrical Bureau, addressed the meeting.

Calling for comments from the assemblage, Mayor Bowman brought forth many expressions of approval for the plan. One speaker, a member of the realty board, provided a surprise by an eulogy of his modern electric home, declaring that if he could not get another electric range he would not take a thousand dollars for the one he has. He also commented on the economy of operating his all-electric home, his remarks having the effect of crystallizing the sentiment of the meeting into a complete endorsement of the Red Seal plan.

James W. O'Brien and Earle C. Richardson have purchased the business of the Walker Electric Company at Salt Lake City. The former was for many years connected with the Utah Power & Light Company as superintendent of lines and service at Ogden, and later as division manager at Park City, Utah. Mr. Richardson was associated with the Richardson-Hunt Company at Ogden as manager of that concern. Both of these members of the new firm are equipped with a thorough knowledge of the electrical retailing business.

Los Angeles Association Elects Officers.—The following have been elected officers of the Electrical Contractors and Dealers Association of Los Angeles: president—B. R. Hensel; first vice-president—C. S. Hill; second vice-president—D. D. McFarlane, Newbery Electric Corporation; third vice-president—R. L. Booth, English Electric Company; secretary-treasurer—J. Arthur Curtis. Helen Mikesell will continue as executive secretary of the association.

Two Districts of California Electragists Consolidate.—The Burbank and Glendale districts of the California Electragists, Southern Division, have consolidated. In this way a larger territory is served by the one organization and a larger attendance is secured at each meeting.

Ball Electric Shop has been opened at 143 Davis Street, Santa Paula, Calif., by C. M. Ball. Mr. Ball formerly was with the Southern California Edison Company and also the Public Service Company of Colorado.

The Eardley Electric Company has moved to 364 South State Street, Salt Lake City. The previous place of business was at 54 Exchange Place.

Meetings

Dr. Millikan Is Guest of Utah Engineering Council

Dr. Robert A. Millikan, director of the Norman Bridge Laboratory of Physics and executive head of the California Institute of Technology, Pasadena, Calif., was the principal speaker at the annual dinner of the Engineering Council of Utah held at the Hotel Utah in Salt Lake City March 22. Dr. Millikan discussed the electronic theory of the constitution of matter.

C. B. Hawley, general manager of the Inter-Mountain Electric Company, was toastmaster at the dinner and made the introductory speech, in which he outlined the achievements of Dr. Millikan.

Dr. Millikan, accompanied by Mrs. Millikan, left immediately after the dinner for the East where he was scheduled to attend a meeting called by Herbert Hoover, Secretary of Commerce, to consider the establishment of a fund of \$20,000,000 for the advancement of pure science in the United States.

Chapter Illuminating Engineers Formed for Puget Sound

Organized late in April, the Puget Sound chapter of the Illuminating Engineering Society held its first programmed meeting in Seattle, May 11, with an illustrated lecture on color. F. A. Osborn, head of the department of physics, University of Washington, Seattle, is chairman of the new chapter.

For the chapter's June meeting it was announced that a talk on "The A, B, C's of Illumination" would be presented.

Contra Costa League to Hold Annual May Party.—The Contra Costa County (Calif.) Electrical Development League has announced its annual May party for May 22, to be held at Livermore, Calif. Women folks of the members have been invited to the festivities, the program arranged being for their especial benefit. Invitations have been sent to the Oakland Electric Club and other Bay region electrical groups to take part in the party with the Contra Costa electrical men.

Explains Klydonograph.—T. P. Garrett, assistant general engineer of the Westinghouse Electric & Manufacturing Company, San Francisco division, explained the operation and uses of the Klydonograph in determining the nature and cause of transmission line surges at a meeting of the Oakland Electric Club, May 3. The lecture was illustrated with lantern slides.

N.E.L.A. Serial Reports.—A 4-page serial report of the meter committee on Periodic Test Schedule for Watt-hour Meters and Method for Recording Results. Price to members 10 cents. A 20-page serial report of the prime movers committee on Coal and Ash Handling. Price to members 25 cents.

Railway Team Wins Los Angeles Electric Club Tournament

Finishing the season with an accumulation of 73 points, the bowling team of the Pacific Electric Railway won the championship in the Los Angeles Electric Club Bowling League. In winning the championship it also won a cash prize of \$102.16.

The Southern California Edison Company finished second, Southern California Telephone Company third, and Los Angeles Department of Water and Power fourth. A total of twenty-four teams took part in the league race with the booby prize falling to the H. H. Walker and Western Light & Fixture Company fives, each scoring 26 points.

Five members of the Electric League will comprise a team which will represent the circuit in the coming Pacific

COMING EVENTS

California Electragists, Northern Division—
Quarterly Meeting—Hotel Senator
Sacramento, Calif.
Friday, May 21, 1926

Electrical Supply Jobbers' Association—
Annual Convention—Hot Springs, Va.
May 31-June 4, 1926

Advisory Committee, California Electrical Bureau—
Jonathan Club, Los Angeles, Calif.
June 7, 1926.

Pacific Coast Electrical Association—
Annual Convention—Biltmore Hotel, Los Angeles
June 8-11, 1926

Associated Manufacturers of Electrical Supplies—
Annual Convention—Hot Springs, Va.
June 7-12, 1926

Northwest Electric Light and Power Association—
Annual Convention—Spokane, Wash.
June 14-17, 1926

American Society of Agricultural Engineers—
Annual Convention—Tahoe Tavern,
Lake Tahoe, Calif.
June 23-26, 1926

American Institute Electrical Engineers—
Pacific Coast Convention, Salt Lake City, Utah
Sept. 6-9, 1926

Coast Bowling Congress tournament, which will start at San Diego on May 1. The lucky knights are R. D. McCubbins of the Pacific Electric Railway team, Jack Emerson of the Southern California Telephone Company team, M. A. Burch of the Los Angeles Department of Water and Power, C. Groschong of the Southern California Telephone Company and L. H. Covell of the Pacific Electric Railway. Joe Sines, secretary of the league, will escort the knights to the southern city.

Puget Sound Company Entertains at Gyro Club Meeting in Everett, Wash.—The Puget Sound Power & Light Company recently furnished the evening's entertainment at the Gyro Club meeting in Everett, Wash., with George Barnes, local manager, in charge. Norwood Brockett, director of public relations, spoke on rates and regulations after briefly outlining the history of the power and light industry. Motion pictures of the new Baker River power project were shown.

Book Reviews

MAGNETS

By CHARLES P. UNDERHILL, consulting electrical engineer; 6 x 9; 468 pages; 467 figures. \$4. McGraw-Hill Book Company, Inc., New York, N. Y.

To an engineer or a student seeking information on the broad subject of magnets, there is probably no text available which treats the subject in as thorough and an interesting manner as this book. According to the author, the object of the book "is to treat broadly the general principles of apparatus electromagnetically operated and controlled, but particularly to treat electromagnetic and permanent magnets in detail."

The introductory chapter covers the definitions of various classes of magnets, the materials, together with their properties, which enter into their structure, and the outstanding phenomena associated with them. Next is treated the various forms of magnets and the general pull characteristics of common forms of constant current magnets, together with methods of varying these characteristics. In a chapter devoted to time and polarity characteristics, the various methods of making electromagnets quick acting, sluggish, or reversible are treated. Then follows a chapter treating that very useful application of the electromagnet in the machine shop and foundry when magnetic chucks and lifting magnets are applied. After a description of switching control, protective apparatus, and miscellaneous electromagnetic devices, the various forms and characteristics of solenoids are treated. Considerable design data are given, and the operating features of commercial shunt-wound and series-wound solenoids are furnished in the form of compact tables. One of the most interesting chapters in the book, from the viewpoint of the student and designer, is that which treats of the logarithmic current-time and voltage-time characteristics of direct-current phenomena. Tables are presented for comparatively easy solution of problems which would require complicated mathematical treatment. Magnetic circuits and their phenomena cover several chapters, and after a short treatment of alternating current phenomena, a.c. solenoids and electromagnets are treated. The book closes with a chapter on permanent magnets. The widespread application of electrical magnets will be appreciated when it is remembered that generators, transformers and motors are merely electromagnets in some combination and the electrification of industry and the development of huge central station systems of today have been paralleled by the development of electromagnet devices that control the operation of various machines used in these very modern industries.

This statement points out very clearly the importance of the various forms of magnets. To the engineer who wishes to obtain more thorough information of the magnet in its various forms and various characteristics and to the student of electrical engineering, this book by Underhill should prove quite valuable.

E. R. S.

Personals

Howard W. Flye, since August, 1919, in the sales department of the San Francisco office of the Aluminum Company of America, has been appointed sales manager of that office. The territory under his jurisdiction comprises



HOWARD W. FLYE

California, Oregon, Washington, Idaho, Utah, Nevada and Arizona. Mr. Flye has been affiliated with the Aluminum Company since his graduation from Yale in 1913, when he entered the operating department. From there he went in 1915 to the Toronto works as superintendent, retaining that position until October, 1917, when he joined the United States Army for service in the World War. From that time until May, 1919, he served as captain in the ordnance department, acting as ballistic inspector in small arms ammunition and as inspector of ordnance in various arsenals and plants operating under United States Army contracts in the United States and Canada. After his discharge from the service he returned to the employ of the Aluminum Company, joining the sales force at Philadelphia, and a few months later was transferred to San Francisco. Mr. Flye is a native of Boston.

William Baurhyte, president, Los Angeles Gas & Electric Corporation, recently left to attend the N.E.L.A. convention at Atlantic City. J. B. Black, vice-president and general manager, Great Western Power Company, San Francisco, also is en route to the convention.

A. E. Wishon, vice-president and general manager, San Joaquin Light & Power Corporation, Fresno, made a trip to Chicago and New York a short while ago.

W. H. Hodge, manager of advertising and publicity, H. M. Byllesby & Company, recently spent a short time in San Francisco. While on the Pacific Coast he visited a number of the Byllesby properties.

F. N. Averill, of the Fobes Supply Company, Portland, Ore., left not long ago for New York by way of the Panama Canal. From there he will go to Hot Springs, Va., to attend the annual convention of the National Association of Electrical Supply Jobbers.

E. O. Howard was re-elected president and chairman of the board of directors of the Utah Light & Traction Company for the coming year at a recent meeting of the board of directors. D. C. Green was re-elected vice-president; George B. Thomas, secretary and treasurer, and John F. Scheib, assistant secretary and treasurer. The executive committee was retained as follows: D. C. Green, chairman; E. O. Howard, David A. Smith, F. C. Schramm and J. M. Bidwell.

W. R. Frampton, superintendent test department, Southern California Edison Company, was in San Diego recently and spent several days with the San Diego Consolidated Gas & Electric Company.

W. F. Raber, vice-president and general manager, San Diego Consolidated Gas & Electric Company, attended a meeting of the board of directors of the Standard Gas and Electric Company in Chicago a short while ago. En route Mr. Raber visited the Southern Colorado Power Company in Pueblo, of which he was general manager for several years.

O. B. Coldwell, vice-president and general manager, Portland Electric Power Company, Portland, has announced the following changes in the organization of the light and power department: C. P. Osborne, formerly superintendent, has been named general superintendent. R. R. Robley, formerly operating engineer, has been named superintendent of operation. C. P. Dunn, formerly designing engineer, has been promoted to chief engineer, with his duties expanded to include supervision of the testing engineer, right-of-way engineer and all assistant engineers, in addition to his former supervision of all the draftsmen and the engineers assigned to construction.

W. J. Dennis, assistant general manager, Northwestern Electric Company, Portland, recently spent two weeks in San Francisco and other California cities.

Leo M. Dunn and J. L. Ray, vice-president and manager of supply and equipment department, respectively, of the Graybar Electric Company, New York, lately made a business trip to the Pacific Coast, discussing with officials and managers of the Western Graybar branches the electrical supply business in the territories visited. While in San Francisco they attended a conference of managers and department heads of the Pacific Coast houses of the Graybar company in Seattle, Spokane, Tacoma, Portland, San Francisco, Oakland and Los Angeles. Others in attendance were Messrs. Wallis, Berry, Colwell, Harper, Vandercook, Billica, Buttner, Brown, Todd, Nicoll, Bray, O'Reilly, Simmons, Crilly, Kelly, Ward and Carson.

Theodore Settle of the General Electric Company, Ltd., London, recently spent a day in Spokane obtaining data on merchandising.

W. R. Matthews, district salesman for the Miller Lamp Company, paid a visit to Spokane recently.

Miss L. Carroll Dangler, home economist for the Edison Electric Appliance Company, spent six weeks in Spokane during the Hotpoint electric range campaign lately conducted there by The Washington Water Power Company.

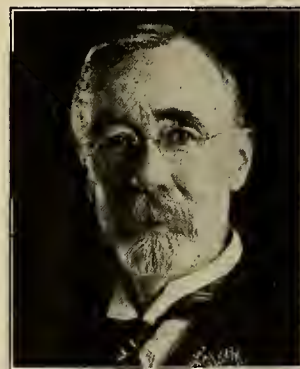
A. H. Jaeger, for the past several years manager appliance division of Edison Electric Appliance Company, Inc., Chicago, has joined the Leonard Refrigerator Company, a constituent company of the recently formed Electric Refrigerator Corporation. Mr. Jaeger will take charge of sales work in association with F. A. Harvey, vice-president of the Leonard company.

Louis Hausmann, formerly of the general engineering department of the South Philadelphia Works, Westinghouse Electric & Manufacturing Company, has been appointed a power engineer in the Chicago district office of the company.

Norwood W. Brockett, director of public relations of the Puget Sound Power & Light Company in Seattle, recently spoke before the Chamber of Commerce on the relation of electric power to industrial development.

E. E. Scofield has been made industrial engineer, and A. H. Wegner assistant industrial engineer for The Washington Water Power Company, Spokane.

Major Cooper Anderson, for the past fourteen years superintendent of power for the Utah Power & Light Company, Salt Lake City, has been appointed general superintendent of production and transmission of that company. This is a new position created as a result of the constantly increasing scope of the operations of the production and transmission departments. A consolidation of all activities of these departments has been effected, and the new superintendent will have complete supervision over them. Major Anderson's record of service with the Utah Power & Light Company and its predecessors extends over a period of twenty-six years, for it was on Feb. 1, 1900, that he accepted the position of general superintendent of the Telluride Power



MAJOR COOPER ANDERSON

Company's properties in Colorado. Prior to that he had spent twenty-two years in steam railroad work. In December, 1907, Major Anderson was promoted to the position of general superintendent of the Telluride Power Company's properties in Utah, with headquarters at Olmsted, Utah. Five years later when the Utah Power & Light Company acquired the properties of that company and various others he was appointed superintendent of power in charge of generation plants and high-voltage transmission and telephone lines in Utah and Idaho.

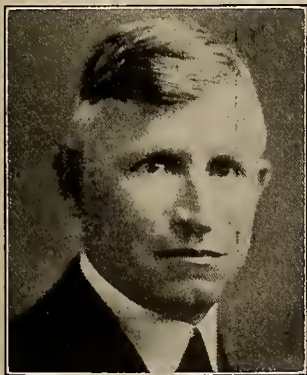
V. P. McNamara has been named resident manager of the Puget Sound Power & Light Company's electric service at Ellensburg, Wash. Mr. McNamara formerly was connected with the company in Everett.

W. B. Milliken, who has been connected with the Servel Corporation for some time, has been made manager for that company in the Rocky Mountain territory with headquarters in Denver, and a branch office in Salt Lake City. He will handle sales in New Mexico, Colorado, Wyoming, Montana and Utah.

L. R. Grime, formerly supply and lighting specialist with the Western Electric Company in Los Angeles, has been appointed district representative of the Graybar Electric Company in San Diego.

A. E. Bacon, who recently resigned from the Mine & Smelter Supply Company in Denver to become the representative of the National Metal Molding Company there, has opened offices at 922 Patterson Building in that city.

Harry J. Bauer, president of the Pacific Gasoline Company, Los Angeles, was elected a director of the Southern California Edison Company to fill the vacancy caused by the death of William E. Dunn. Mr. Bauer entered the employ of the company nineteen years ago as a junior clerk in the legal department at a salary of \$25 per month, two years before his graduation from the law school of the University of Southern California, of which he is now a trustee. During the succeeding years he rose through the gradations of the legal department to the position of general counsel, retiring in 1919 to look after his own financial interests and organize them into the corporation of which he is now the head. For many years Mr. Bauer has been the close friend and associate of John B.



HARRY J. BAUER

Miller, president, and R. H. Ballard, vice-president and general manager, of the company, and of all the other officers and directors, and brings to the directorate an exact and intimate knowledge of its business, financial, and legal affairs. Mr. Bauer's election is in line with the long established policy of the Edison company in promoting to responsible positions and associating in its management those who have grown up with it and by their own initiative have developed the capacity for filling the most responsible positions of trust.

Lee Moselle, for the past ten years chief clerk of the business agent, Bureau of Power and Light, Los Angeles, has resigned to become secretary of the City Club, Los Angeles. Mr. Moselle has been connected with first the Water Department and later the Bureau of Power and Light for the past nineteen years.

Jack Reinke of the Edison Lamp Works, not long ago gave the Electric Club of Seattle an illustrated talk on the manufacture of Mazda lamps.

A. C. Cornell, Robert Miller and L. M. Cargo, members of the advisory board of the Electrical League of Colorado, and S. W. Bishop, executive manager of the organization, attended the meeting of the Rocky Mountain Electrical Co-operative League in Salt Lake City a short time ago. Messrs. Cornell and Bishop were on the convention program.

David M. Roderick, for the past four years district representative in the Seattle territory for the Hoover Suction Sweeper Company, and for the past year president of the Electric Club of Seattle, has resigned his position to become general sales manager of Fuller Bros. & Company, Inc., with headquarters in New York City. He has been succeeded by George L. Collier, formerly Krantz safety-switch specialist with the Westinghouse Electric & Manufacturing Company. Tom Wood, vice-president of the Electric Club, will succeed Mr. Roderick as head of that body.

Bert Rowley, district manager of the Edison Electric Appliance Company, and Lester Johnson, district representative of the merchandise department of the General Electric Company, both with headquarters in Salt Lake City, attended the recent state-wide meeting of electrical men sponsored by the Electrical League of Colorado in Denver.

Ralph Cordiner, representing the Edison Electric Appliance Company, spent the week in Spokane not long ago.

R. B. Wooley, advertising manager, Savage Arms Corporation, Utica, N. Y., recently paid a visit to the Pacific Coast.

R. H. Ballard, executive vice-president and general manager, Southern California Edison Company, Los Angeles, was one of the speakers at the recent annual banquet of the Chamber of Mines and Oil in that city.

F. L. ReQua, formerly office manager, H. B. Squires Company, San Francisco, has resigned to become a member of the firm, Welding Service, Inc., of that city.

H. B. Betts, of Thomas & Betts, New York, has been visiting in Los Angeles with his local representative, the H. B. Squires Company.

A. H. Tracy, electrical engineer, Byllesby Engineering and Management Corporation, spent a few days with the San Diego Consolidated Gas & Electric Company not long ago. Mr. Tracy's itinerary included several Pacific Coast properties of the Byllesby chain.

L. A. Hobbs, Pacific Coast district manager, Edwin F. Guth Company, St. Louis, with headquarters in San Francisco, recently returned to that city after a trip to the company's home office. On his way back he stopped at Seattle, Portland and Vancouver.

R. W. Abright, city electrician of Long Beach, Calif., has been elected president of the Long Beach Electric Club. Mr. Abright has been a member of the electrical fraternity since 1904 when he entered the employ of the Southwest Engineering & Construction Company, Dallas, Texas. Three years later he became journeyman wireman in an electrical contracting shop. From 1911 to 1913, inclusive, he served as city electrical inspector for Dallas, and followed that by engaging in the electrical contract-



R. W. ABRIGHT

ing business for two years. After the World War, in which he saw service overseas and was discharged from the army as first lieutenant in the Signal Corps, he again entered the electrical contracting business, this time in the oil fields at Wichita Falls, Texas. Then he went to Long Beach where for two years he was affiliated with the electrical contracting firm of Ward Akley, Inc., finally becoming city electrician, a position he has held for the last three years. Mr. Abright has been president of the California Association of Electrical Inspectors for the past year.

C. B. Hall, president of the Illinois Electric Company, Los Angeles, recently returned from an extensive business trip through the East. Mr. Hall went and returned by way of the Panama Canal.

Harry Harper, manager of the Graybar Electric Company, Los Angeles, was a recent business visitor to San Francisco.

Elbert Kramer, until recently in charge of sales of Universal appliances in the Northwest territory for Landers, Frary & Clark, New Britain, Conn., has been appointed manager of the range and appliance department for Listenwaller & Gough, Inc., Los Angeles.

Obituary

Delbert A. Haase, district line maintenance supervisor of the Puget Sound Power & Light Company at South Cle Elum, Wash., was killed instantly on March 29 when he was crushed beneath a pile of cedar poles he was supervising unloading in South Cle Elum.

TRADE NOTES

Beaver Machine & Tool Company, Inc., Newark, N. J., has issued recently a new 20-page catalog, covering its entire line of products. Descriptions of heater plugs, switch plugs, attachment plugs, switches, sockets, receptacles, are given as well as photographic illustrations. Detailed price lists also are included in the catalog.

The Robert June Engineering Management Organization, Detroit, has moved to larger quarters at 2208 West Grand Boulevard, where it now occupies the entire building. This is the company's fourth move in four years to larger quarters. The new building will give it greatly added facilities for serving its clients.

The Okonite Company, Passaic, N. J., has issued recently a series of folders descriptive of its products. The folders are produced in bright colors with catchy covers to attract the eye. Copies can be had by addressing the company.

Hobart Brothers Company, Troy, Ohio, has produced the new HB high-rate battery tester, which is designed to test all three cells of a battery without removing it from the car. The carbon pile rheostat, with ammeter calibrated 300-0-300 and the three voltmeters calibrated 3-0-3, make it possible to test all three cells at the same time under discharge conditions such as exist when the car is actually in use.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued a special publication No. 1643-A describing the application of oil circuit breakers. It covers fully the general application of oil circuit breakers, the determination of short circuit current, and the precautions necessary, and devotes a number of pages to tables and charts.

Curtis Lighting, Inc., Chicago, has issued a set of architects' detail plates showing methods of church lighting, gymnasium lighting and concealed lighting effects in legislative chambers of the House of Parliament, Ottawa.

Ohio Brass Company, Mansfield, Ohio, has produced a new O-B copper arc weld bond with terminals which retain and support the deposited metal. This new product is known as the Titon bond.

Pass & Seymour, Inc., Syracuse, N. Y., has produced a new canopy switch known as P&S 3310. Various types of wall brackets may be used with this new supporting switch from the flat back to the deep embossed plate, where the proper outlet box is installed.

The Swartzbaugh Manufacturing Company, Toledo, Ohio, has developed a two-heat combination electric cooker, thermal jug, ice cream freezer and fireless cooker, known as EC Jr.-10.

The Graybar Electric Company recently opened offices in San Diego, with L. R. Grime as district representative. Mr. Grime was for six years with the Western Electric Company in Los Angeles, in the capacity of supply and lighting specialist.

J. G. Pomeroy Company, formerly at 51 Federal Street, San Francisco, has moved into its new building at 960 Folsom Street.

The Torrington Company, Torrington, Conn., has issued a new catalog on ball bearings, which gives complete details of the entire line of open (magneto) and closed (radial) types of ball bearings, which range in shaft size from 4 m/m (.1575) to 25 m/m (.9842). Another publication entitled "Romance of Needle in Little Torrington" has been printed in booklet form.

Truscon Steel Company, Youngstown, Ohio, has issued a folder descriptive of its steel poles, pointing out their economy, permanence and safety advantages. Photographic illustrations are included in the folder.

The Rix Company, Inc., with offices in San Francisco and Los Angeles, has issued bulletin P.C. 103, describing its portable air compressors. The bulletin is illustrated and gives complete specifications.

Fairbanks, Morse & Company, Chicago, have introduced a new improvement in motor lubrication in the furnishing of proper greases in collapsible tubes, each containing just enough grease for a motor's annual requirements. After flushing out the old grease with kerosene as directed in printed instructions supplied with the tube, the new FMCO grease is squeezed from the grease tube directly into the bearing. Four sizes of tubes are available for corresponding sizes of bearings.

Roach Appleton Manufacturing Company, Chicago, has appointed George A. Kieffer, 141 Fremont Street, San Francisco, as representative of its line of wiring supplies for the northern California territory. Mr. Kieffer will maintain warehouse stock in San Francisco. The company also has appointed the Wesco Company, Seventh and Lawrence Streets, Denver, as representative for the Rocky Mountain region. Warehouse stocks also will be kept in Denver. Walter G. Michel, 312 Omar Avenue, Los Angeles, is the Coast representative in southern California.

The Quigley Furnace Specialties Company, New York, has issued a booklet describing the Quigley refractory gun for quick repairs and maintenance of furnace linings, including hot patching and surface coating.

Uehling Instrument Company, Paterson, N. J., is distributing a new catalog No. 150, covering its combined barometer and vacuum recorder for use with steam turbines. This instrument records the absolute back pressure of the turbine exhaust. High accuracy is claimed for the instrument because of the mercury column principle employed.

Collyer Insulated Wire Company, Pawtucket, R. I., has issued a small folder illustrating and describing its different types of covered wires.

Mutual Electric & Machine Company, Detroit, has produced a new product known as the "Bull Dog" Saftofuse, which represents a new departure in "safe switching and safe fusing," with a capacity of 30-amp. and 60-amp., 250 volts. Bulletins No. 102, 103 and 104, describing this material and their application are now available.

The Ludlum Steel Company, Watervliet, N. Y., is enlarging and rebuilding one of the ingot heating furnaces for its 18-in. mill. This will result in a greatly increased output from this mill.



Quienes son estos caballeros? With the exception of H. C. Rice, who is assistant manager of the merchandising department of the Southern California Edison Company, the entire group is made up of representatives of the Frigidaire sales organization of southern California, all headed for the tenth annual Frigidaire convention at Dayton, Ohio, April 8 and 9. Left to right—Ivan De Jong, Jacques Tyrol, T. J. McIntire, J. M. Hull, W. A. Drann, H. C. Rice, G. E. Tabor (over the rail), Roy C. Miller (in back), H. S. Jordan, Herbert Bell, Earl Myers and George H. Ratterman and Sam Fingerhut (on step).

Load Building

Plus Industry Building

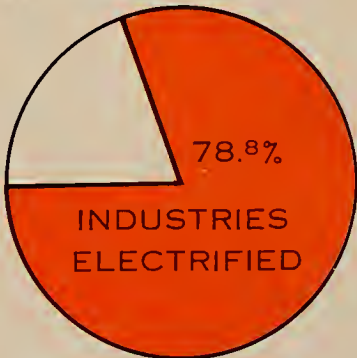
By and with the Power Companies of the
Pacific Coast Electrical Association

Electrical development has become the index of community growth and industrial progress. This is due primarily to the initiative of the central stations in bringing about a close study of the problems involved, the development of new apparatus and practices, preparation for

the future, and the establishment of public relations by which the public is participating as partners in power development as a community enterprise. These conditions are a consequence of the close co-operation of member companies of the Pacific Coast Electrical Association.

Generator rating during the period Jan. 1, 1920 to Jan. 1, 1926 has increased 125 % .

Generator rating	Jan. 1, 1920	934,828 kw.
Generator rating	Jan. 1, 1926	2,104,393 kw.
Hydro	Jan. 1, 1926	1,416,718 kw.
Steam	Jan. 1, 1926	687,675 kw.



A 70% increase has been made in the yearly kw.-hr. generation during the period Jan. 1, 1920 to Jan. 1, 1926.

Kw.-hr. generated	1920	3,726,000,000
Kw.-hr. generated	1925	6,261,000,000

78.8% of industry is electrified

Connected load during the six years has increased by 1,780,896 kw.

Connected load	Jan. 1, 1920	1,906,104 kw.
Connected load	Jan. 1, 1926	3,687,000 kw.
Domestic and Commercial Lighting	Jan. 1, 1926	1,284,000 kw.
Agricultural	Jan. 1, 1926	461,000 kw.
Railroads	Jan. 1, 1926	232,000 kw.
Mining	Jan. 1, 1926	95,000 kw.
Industrial	Jan. 1, 1926	1,339,000 kw.
Miscellaneous	Jan. 1, 1926	276,000 kw.



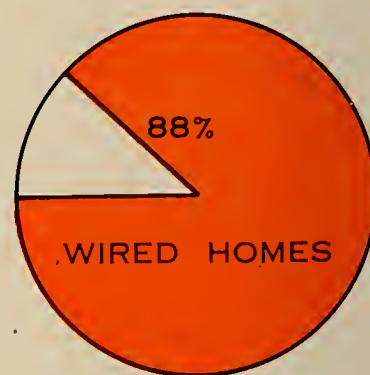
The territory of the P. C. E. A.

The Growth of General Building and Construction

The Outlook for Electrical Appliance Sales in the Territory of the *Pacific Coast Electrical Association*

Consumers numbering 758,440 have been added to the lines of the central stations in the P. C. E. A. territory from Jan. 1, 1920 to Jan. 1, 1926

Total consumers	Jan. 1, 1920	795,000
Total consumers	Jan. 1, 1926	1,553,440
Domestic	Jan. 1, 1926	1,198,680
Commercial	Jan. 1, 1926	254,430
Industrial	Jan. 1, 1926	100,330



Building permits in 1925, for 13 of the principal cities in the P. C. E. A. territory, were \$188,606,502 greater than in 1920

1920	\$ 138,750,770
1926	\$ 327,357,272

88% of all homes are wired

In no section of the country is greater use being made of electric service by the domestic consumer. During 1926 it is estimated that over \$17,000,000 will be spent by consumers in these three states for electric labor saving household devices. This will be divided substantially as follows:-

	Washing machines	\$ 4,640,000
	Ranges	\$ 3,850,000
	Vacuum cleaners	\$ 2,210,000
	Refrigerators	\$ 1,650,000
	Irons	\$ 818,000
	Water heaters	\$ 550,000
	Ironers	\$ 495,000
	Percolators	\$ 441,000
	660-watt air heaters	\$ 408,000
	Toasters	\$ 393,000
	Waffle irons	\$ 324,000
	Fans	\$ 171,000
	Miscellaneous	\$ 1,100,000

Since 1913 the cost of living has increased 65%.

Whereas the cost of electricity has decreased 8%.

Journal of Electricity

Devoted to the Economic Production and Commercial Application of Electricity
IN THE ELEVEN WESTERN STATES



Wherever Concrete is Used

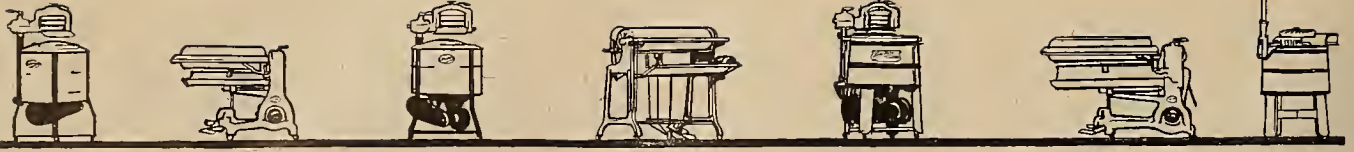
When you contract for concrete construction it will pay you to specify the use of the admixture *Celite*. This approved workability agent enables the placing of concrete of higher effective strength, greater watertightness and better uniformity than can be attained by any other method.

It saves labor costs by reducing the amount of manipulation necessary to work the concrete into place. It prevents segregation, which is the cause of honey-combing, even when central mixed concrete is used. It overcomes the difficulties encountered in "gunning" and "chuting" concrete.

A white siliceous powder, *Celite* is simply added with the other dry ingredients at the mixer. No special equipment is required, no revision of methods necessary. May we send you a standard form for the specification of *Celite* and our complete bulletin on *Admixtures in Concrete*? Address: *Celite Products Company*, 140 Spear Street, San Francisco.

CELITE

Insures Better Concrete at Less Cost



Fifty-Five Years of Store Selling

THE SATURDAY EVENING POST

June 16, 1926



Fifty-five years of experience
guides the American woman in her selection

A SMALL home-drawn wagon probably delivered the first Horton to the first store that ever sold a washing machine.

That was back in 1871, fifty-five years ago—but it has an important bearing on what you get for what you pay, for a modern electric washer or ironer, delivered in a modern motor truck, to the modern store today.

That first machine was a Horton. And Horton Washers and Ironers are sold by stores today as they were fifty-five years ago.

Therein lies the determination of Horton quality and value—and quite generally the quality and value of other washers and ironers.

Quite naturally, the first mechanical washer took the natural and economical channel of distribution—maker to wholesaler, to local store, to the home.

Quite naturally, other people made washers—until today thousands of homes wash modern electric washers and ironers, and hundreds of people make hundreds of kinds.

The wholesalers and stores are constantly plying with to carry and sell all these different kinds—what, of course, they cannot do.

So the wholesalers and the stores select the



best of the kinds—and the others have to sell by personal canvassing or other methods.

Any other method than the natural, store-method of selling is apt to be more expensive.

If the selling or distribution method is more expensive, then the price must be higher—or the quality lower.

To compete with Horton, at the Horton price established by low-cost, Hardware-Wholesaler, Local-Store Distribution, others seek higher distribution costs have had to skimp the quality.

Through all these fifty-five years, Horton has held the confidence of the greatest Hardware Wholesalers and the best Local Stores.

Hortons have by far the greatest natural, unforced sale of all washers and ironers.

That is why it is safer to buy a Horton from a responsible local store than some other kind from a stranger at your door.

Quality in a modern electric washer or ironer, means doing the work easily and well, doing it year in, year out, with little or no service requirement, doing it for many years.

On that score, American women, as a rule, say "There is nothing like a Horton."

THE HORTON MANUFACTURING COMPANY (Established 1871) FORT WAYNE, INDIANA

HORTON Washers
Ironers
SOLD BY 8086 STORES

THE COUNTRY GENTLEMAN
July, 1926

THE SATURDAY EVENING POST
June 5, 1926



How the best washers and ironers
find their way into the best stores and homes

OURS is a country of vast production—and of vast distribution.

When the family buys a modern electric washer or ironer, it is conscious of having to pay what it costs to make the machine, forgetting that there is also a cost of getting the machine from where it was made to where it is going to be used.

Yet costs of distribution are apt to vary, as between different producers, much more than their costs of production.

So the cost of distribution is apt to determine cost of production—and therefore quality.

The natural and economical distribution is from maker to wholesaler, to local store, to home.

Neither the wholesaler nor the local store can afford to carry and sell all the many different kinds of washers and ironers.

Each, therefore, tries to select the best from the many.

If one more has the best, another wanting something different, aims to have the next best.

But in the main, the wholesaler with the largest

business, and the local store with the largest patronage, are apt to carry and sell the best.

Natural selection works out that way.

And if the maker who wins the best-store selection has the best machine in the first place, he soon has a better machine because his advantage of lower-cost distribution enables him to have a higher cost of production—a better quality.

Almost everywhere the best and biggest local stores and the best and biggest Hardware Wholesalers carry and sell Horton Washers and Ironers.

The current from Horton to Home flows naturally, at lowest conceivable cost, in a channel deeply grooved by fifty-five years of trading.

That is why Horton advantage and Horton quality and prestige have grown importantly with the years.

You need only follow the expert selection of wholesalers and stores, affirmed and re-affirmed year after year.

See if it has worked out this way in your town.

Phone your best local store and tell them you would like to know more about Horton Washers and Ironers.

THE HORTON MANUFACTURING COMPANY (Established 1871) FORT WAYNE, INDIANA

HORTON Washers
Ironers
SOLD BY 8086 STORES

A Nationally Organized Movement to Increase Retailers' Profits

TO Make Retailing More Profitable is the basic object of this great movement to concentrate buying of household Laundry Equipment in Retail Stores.

More than a hundred leading Hardware Jobbers are economically distributing Horton Electric Washers and Ironers to dealers in every state.

Eighty million pages of advertising are selling the public on buying Horton from Reliable Local Merchants.

Let us send you "Getting Back Into the Main Channel"—it will tell you how you can get your share of this bigger profit.

THE HORTON MANUFACTURING COMPANY, (Established 1871) 1024 Fry Street, FORT WAYNE, IND.

HORTON Washers
Ironers

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WORK IN PROGRESS

1926

1924

1922

MAY, 1926

DESIGN-BUILD
OPERATE
FINANCE

STONE & WEBSTER

INCORPORATED

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EDITORIAL

Serving the Pacific Northwest

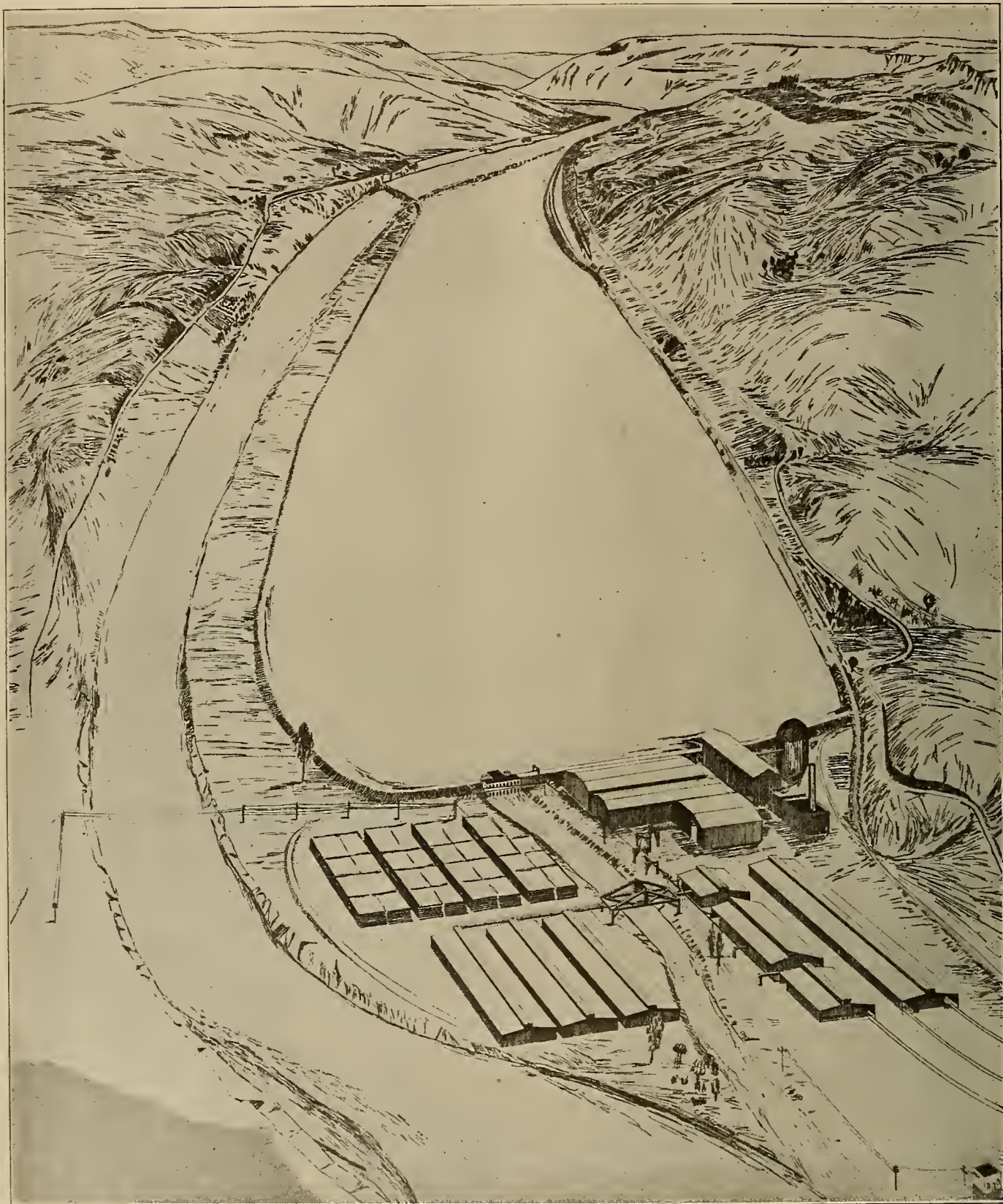
THIS issue of the Journal of Electricity marks an extension of its service that is of more than passing interest. Through an arrangement recently concluded with the officers and executive committee of the Northwest Electric Light and Power Association, the Journal presents to all of its readers for the first time the pre-convention publication of that association's committee reports. These reports summarize the results and findings of all committee work for the past fiscal year covering the progress of the electrical industry in the great Northwest, a territory comprising the states of Oregon, Washington, Idaho, Utah and Montana.

IT is with no little pride that this announcement is made. Through the two associations, the Pacific Coast Electrical Association covering California, Arizona, Nevada and Hawaiian Islands, and the Northwest Association, the Journal of Electricity offers to the industry in the West a medium of publicity that is as nearly 100 per cent complete in the comprehensiveness of its service as is humanly possible. Moreover the intention is to make this service even more complete.

THE value of this service to the industry as a whole is obvious. The studies, researches, and conclusions prepared by the students, analysts and leaders in every geographical section are thus at the disposal of everybody. The spirit of the slogan, "Better and Better Service to the Public," is fostered and promoted through the wide dissemination of knowledge in a manner and with a thoroughness that is possible through no other means.

THE intellectual communion between the leaders of the industry, the educational and inspirational quality brought into the offices and the homes of the rank and file of the industry personnel, cannot do other than cement more firmly than ever the bond of fellowship among the electrical men of the West and create a greater and greater solidarity within the industry by the interchange of ideas through the columns of the Journal.

TO the men of the Northwest we take this occasion to express our appreciation of the privilege that has been granted to us, and we look forward with confidence to the discharge of our responsibility with all the resources at our command.



ENGINEER'S sketch of the proposed Lewiston hydroelectric development of the Inland Power & Light Company, looking East. A diversion dam 35 ft. high on the Clearwater River will turn water into a flat now used for small farms, creating a 400-acre forebay and log pond. An earth fill dike, 7,000 ft. long, running along the river sustains the forebay. In the dike at the west end of the forebay is seen the power house, which will contain two 5,000-kw. units. A tailrace 4,500 ft. long carries the water back to the river below. A 66,000-volt tie line will connect the development with the Yakima-Walla Walla line of the Pacific Power & Light Company, which will operate the property. Adjacent to the power house will be the proposed sawmill development of the Clearwater Timber Company (a Weyerhaeuser company), which will cut 200,000,000 ft. per year. Lewiston, Idaho, lies west of the development.

The Northwest's Contribution to the Passing Year

By Lewis A. Lewis

President, Northwest Electric Light and Power Association; Northwest Division, National Electric Light Association

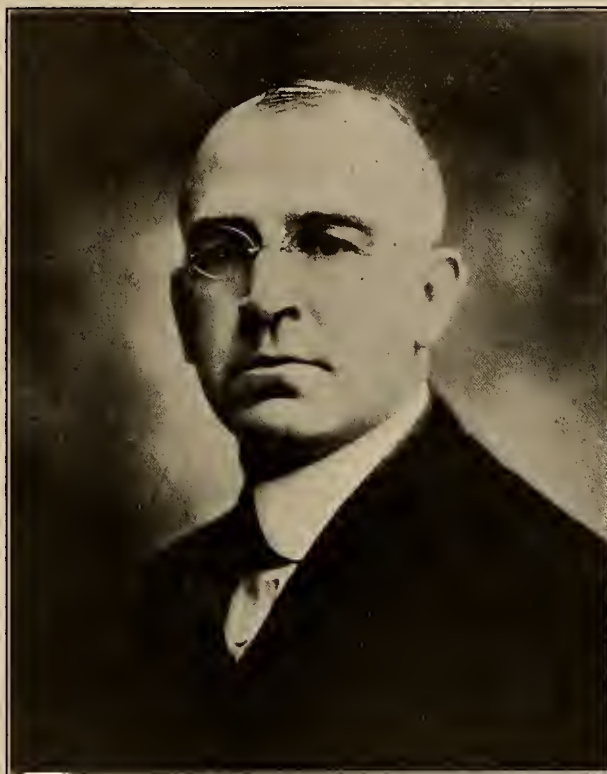
A YEAR significant in many of its aspects is being brought to a close for the Northwest Electric Light and Power Association with the convention in Spokane, June 14-17, 1926. Looking back over it, the year has been productive of many notable works.

As the Northwest Division of the National Electric Light Association this Northwest Association was given responsibility for the conduct of the National Electric Light Association's activity in this field. The electric range survey conducted for the parent organization provided this Association with an opportunity to contribute something of value to the knowledge of the industry upon that important domestic appliance, the electric range. By reason of the highly intensified range load in this territory, a

committee from our Association has been able to assemble information which will have an important part in making electric cooking universal. The electric range survey and the report covering it will be important items of discussion at the convention.

In its own particular and oftentimes distinctly sectional activities, the Association likewise has made careful analyses of its problems and studied into their remedies. Each of the Sections of our Association has had a fruitful year. Individually they have carried out their programs in a highly commendable manner.

Early in the year three of the four Sections of the Association, namely: the Accounting, Commercial and Technical Sections, each resolved to hold a two-day Section conference to better discuss and co-ordinate the work each had set out to accomplish. These conferences achieved the objects sought for to a very satisfying extent and many important thoughts and ideas were developed in them.



LEWIS A. LEWIS

President of the Northwest Electric Light and Power Association, who reviews the work of the organization for the past year and comments upon the coming convention

In the Public Relations Section, too, many valuable contributions to the good work of the industry have been made. Particularly noteworthy, in my opinion, is the work of the Women's Committee on Public Information. Its effect upon public relations has been a definite reality this year. The promise it gives for further activity is also worthy of attention.

While public relations generally is in excellent shape in the various states of this division, legislation inimical to the interests of the industry has been proposed in Oregon. The attention of members is directed particularly to the report of the vice-president in charge of public relations for Oregon in which these measures are discussed. The problem of selling our industry to the public to such an extent that political radicals will not dare to

propose legislation which threatens its well-being is one to which more time and study must be given.

At the convention, because so much of the actual Section work has already been accomplished in the Section two-day conferences, we hope to present a program strong in its educational and inspirational features. Largely the program will consist of addresses by persons of broad experience and keen insight into the problems of the industry, although some time will be devoted to Section work as well.

We hope to stress the importance of the residential load in public utility development. We hope to urge a more consistent sale of current-consuming devices for the home. In this field lies much of the best load which a central station may cultivate.

Rural electrification, we hope to show at the convention, must be given more constructive thought by executives of power companies. This we feel must come, notwithstanding the fact that the West is well ahead of other sections of the country in farm electrification.

Accounting Section Reports

Executive Committee Report*

Organization of this section was completed Sept. 21, 1925, under the standing committee revision of the Accounting National Section, Aug. 20, 1925.

In the revision marked changes were made in committee nomenclature. The budget, customers' records and billing methods, filing and preservation of records and payroll standardization committees ceased to exist as such. The budget committee became national in scope rather than local, while the customers' records and billing methods and filing and preservation of records were merged into the accounts receivable committee, and statistical methods committee, respectively, two entirely new committees. Payroll standardization was absorbed by the accounts payable committee, a committee inactive for several years past but again given recognition.

Paralleling the Accounting National Section were appointed committees as follows:

Classification of Accounts

M. J. Wilkinson, chairman, assistant secretary and assistant treasurer, Pacific Power & Light Company, Portland, Ore.

Purchasing and Storeroom

F. W. Brownell, chairman, comptroller, Puget Sound Power & Light Company, Seattle, Wash.

Fixed Capital

J. A. Rockwood, chairman, valuation engineer, Portland Electric Power Company, Portland, Ore.

Accounts Payable

F. H. Anderson, chairman, assistant treasurer, Puget Sound Power & Light Company, Portland, Ore.

Accounts Receivable

A. E. Janssen, chairman, treasurer, Idaho Power Company, Boise, Idaho.

Statistical Methods

Wm. H. Hawkes, chairman, Puget Sound Power & Light Company, Olympia, Wash.

D. F. McCurrach, vice-chairman, statistician and rate engineer, Northwestern Electric Company, Portland, Ore.

Scope

Scope of committee work was designated as follows:

Classification of Accounts Committee.—To endeavor to secure the adoption of the uniform classification of accounts and standard form of annual reports by all member companies and by regulatory commissions having jurisdiction over accounting procedure; and to assist in their interpretation and application.

Purchasing and Storeroom.—To study and report on systems of accounting for the purchasing, storing and issuing of materials and supplies.

Fixed Capital Committee.—To study and report upon methods for the preparation, maintenance and use of fixed capital records and accounts, including work order or other related systems under which distribution of capital expenditures is accounted for.

Accounts Payable Committee.—To study methods and practices for accounts payable including general ledger accounts, voucher check systems and payroll standardization.

Accounts Receivable Committee.—To study methods and practices for accounts receivable, including customers' records and billing, meter reading, credits and collections, and merchandise accounting.

Statistical Methods Committee.—To study and report upon methods for the arrangement and preservation of statistical data, including graphic presentation; to promote the standardization of statistical information and terminology, and to study developments and changes in filing, preservation and destruction of records.

Activities

The geographic divisions were organized Oct. 21, 22, 1925, at St. Louis, Mo. Our section had three representatives at that meeting, a somewhat larger number than usual at Accounting National group con-

ferences. The convention was for the purpose of co-ordinating accounting section activities. These, in brief, called for securing permission from an executive for a desired man to serve in any capacity on committee work, with territorial subdivision of the district for the purpose of canvassing them for problems peculiar to the utilities therein, and submitting them to the national body for study and research.

The principal is sound fundamentally since it weaves into the fabric of the accounting story problems furnished by the industry at large rather than those furnished by a selected group of preferred specialists. It is obvious that this plan presents a broader view of our problems, with the resulting solutions truly national in interpretation. Breaking down the sources of information into districts and restricting each district to a particular committee prevents duplicating requests for information within that territorial zone. It also allows committees to meet at small expense and loss of time at some central point within their field of action to discuss matters pertaining to their work, without being forced, as in the past, to transact their business at long range.

The geographic chairman selects the standing committee chairmen only, while the latter select their own committeemen. Because of this phase of the plan each chairman assures for himself a reasonable measure of co-operation for a successful committee year.

This, in brief, is the co-ordinate plan and is recommended as the proper basis of procedure in committee work.

Assignment of Work

The governing committee, comprised of standing committee chairmen, met Dec. 4, 1925, and reported progress. At that time it was decided to hold a group meeting Feb. 1, in Portland. Here crystallized the idea of imposing upon a committee something definite to accomplish, some specific line of action to follow rather than to attempt to cover the entire scope of a committee's work. Topics in tentative form for discussion were assigned to the several chairmen upon which to present papers with the ultimate plan that of using the material brought out in conference in the finished report. The subjects assigned embraced inventories, annual reports, distribution records adaptability of machines to accounts payable records and payroll distribution, and exchange of credit information.

On Feb. 1, 1926, the first group meeting of our section was held. The attendance was far in excess of our most sanguine expectations, and while Oregon and Washington alone were represented it is hoped that a continuance of such meetings yearly will ultimately attract the membership of other states within our division.

Tentative reports were submitted under the subjects assigned at the meeting of Dec. 1, 1925. Fairly good indices to a successful meeting may be considered by the number participating in the discussion, and the breadth of ideas brought out. The conference was active, interest widespread and discussion lively. Minutes of the meeting were reported in regular form, and each chairman later secured that part of the minutes relating to his particular work, so that he might have the benefit of the discussion appertaining to it in the preparation of his final report.

In addition to the subjects assigned there certain matters were debated relating to accounting methods as connected with methods of practice in handling items removed from a plant and taken into stores; methods of computing interest during construction; costs of maintaining temporary service during construction; costs of moving a telephone line to provide clearance for constructing a power line; costs of re-

* A. J. Johnstone, Portland Electric Power Company, chairman. Idaho Power Company: A. E. Janssen, Northwestern Electric Company: D. F. McCurrach, Pacific Power & Light Company: M. J. Wilkinson, Portland Electric Power Company: J. A. Rockwood, Puget Sound Power & Light Company: F. H. Anderson, F. W. Brownell, W. H. Hawkes.

moving existing equipment in a power plant or substation to make room for additional installations.

It was the consensus of opinion that certain of these subjects be submitted by the Classification of Accounts Committee to the national committee for solution and interpretation, that its decisions might become available to the industry at large.

A resolution was offered thanking the Portland Gas & Coke Company for its courtesy in permitting the use of its assembly room for the conference.

This section feels that much benefit is to be gained through group meetings, and strongly advocates their continuance. We recommend, therefore, that at least a mid-winter group meeting be held each year and urge that such practice become a part of the accepted routine.

Work Accomplished

A resume of the work accomplished by the several committees follows:

Classification of Accounts.—Interest was centered upon the adoption by the several states of the Railway and Utility Commission, Simplified Form of Annual Report. This form has much to commend it, containing as it does all the best features of the state commission form of report now in use. Besides giving standardization of statistics, above all else, and the thing most desired, it gives uniformity for those utilities operating in several states.

Purchasing and Storeroom.—This committee set out with the idea of accomplishing something for the benefit of the smaller companies, and submitted a very comprehensive report on "Inventory of Supplies." While the committee had in mind the small utility inventory conducted on an annual basis, the system outlined proved to be admirably adapted to the large utility as well. The committee, therefore, heartily recommends the method to those companies without an orderly system of inventory.

Fixed Capital.—The efforts of this committee were largely concerned with the methods which have to do with distribution

records. In providing something which might be of benefit to those companies interested in arranging their detailed records in accordance with accepted practices, this committee has outlined a system which is the result of experience gained in many a year's study as well as the application of basic principles. Because of the danger of too great refinement in detail of such records, the committee has not recommended it for general use by all utilities, but is hopeful that application of the system may prove helpful to those companies which are desirous of keeping such records at a minimum expense).

Accounts Payable.—This committee considered the uses of tabulating machines in connection with distribution of vouchers and payrolls, with special reference to the records of small companies. Objections have been raised to some types of machine on the grounds that there are enough problems in accounting without injecting those of mastering a new language. However, distribution can still be accomplished by other types of machines which may be adapted to work of this nature.

Accounts Receivable.—Standardization of practice with respect to interchange of credit information seemed desirable; therefore, the committee considered this phase of the scope of its work only. In practice the system hinges largely on public relations, in that a new consumer is allowed to establish his own credit without being obliged to cover his account for service by deposit. In the larger companies the credit department moulds the opinion of a new customer. It is obvious that if he is allowed to establish his rating through references, as is the custom with mercantile houses, his impression of the utility is favorable from the outset. Serious consideration should be given to this plan by all utilities embraced in our group.

Statistical Methods.—Due to conditions imposed through a change of residence it became necessary for the chairman to appoint a vice chairman to carry on the work of this committee. D. F. McCurrach, statistician and rate engineer, Northwestern Electric Company, was selected to fill this very important position and has submitted a very comprehensive report dealing with the statistical information deemed essential to the industry. The subject is entirely new and the object seems to be to minimize details in connection with keeping information for reports and publications. There is some likelihood of conflict between the work of this committee and that of the committee on simplified annual reports; therefore, it would seem that this work should be national in character rather than local.

Classification of Accounts Committee Report*

Although the committee year has not been completed, we wish to report the progress that has been made to date with respect to the special work assigned to this committee on classification of accounts and annual reports.

As stated in previous reports, all of the state commissions within this geographical section have adopted the uniform classification and therefore the efforts of this committee have been directed towards the adoption of the uniform annual report.

We are pleased to be able to report that the state of Idaho has adopted this annual report form as issued by the National Association of Railway and Utilities Commissioners.

In conjunction with the new classification of accounts adopted by the Oregon Public Service Com-

mission as of Jan. 1, 1925, a new report form has been compiled and it is evident that suggestions pertaining to uniformity were given consideration in so far as the financial portion of the report is concerned, but relative to the statistical portion of the report, no heed was given, as the detail requirements of this new form far exceed anything heretofore requested.

The committee has held an informal interview with the chief engineer of the Oregon Public Service Commission, who is responsible for the compilation of this new report form, and he has agreed to discuss that portion of the report which might be considered burdensome and inconsequential.

During the remainder of the committee year it is the intent to present to each public service commission within this section, our arguments in favor of the uniform report with the view of its adoption but it must be remembered that it will take time and discretion to accomplish the desired results.

*M. J. Wilkinson, Pacific Power & Light Company, Chairman. Idaho Power Company: R. W. Miller. Puget Sound Power & Light Company: C. F. Kirchaine.

Purchasing and Storeroom Committee Report*

The work of this committee has been limited to the subject assigned; namely that entitled "Inventory of Material and Supplies."

The uniform classification of accounts for electrical utilities provides that inventories of materials and supplies should be taken at least annually. This can be accomplished in one of two ways:

First.—By what is called a continuous inventory, which plan is generally applied by inventorying a specific portion of the supplies each day, reconciling the physical stores record with such inventory and once each year, or more often, reconciling the physical stores record with the control account on the general books.

Second.—By what is generally referred to as an annual physical inventory.

From an accounting standpoint there is no question but that the continuous inventory plan has a great deal of merit, but from a practical standpoint the

annual physical inventory plan seems to be more advantageous and to obtain better results. For the purpose of this paper the discussion will be confined entirely to the annual physical inventory plan.

Annual Physical Inventory Plan.

While the taking of an inventory of materials and supplies of each utility company is made mandatory by the regulatory bodies, it must be recognized that such an inventory serves many beneficial purposes to the utility. It furnishes a comprehensive record of the classifications and quantities of materials and supplies on hand in such a manner as to keep this information readily available for the attention of the officers and executives of the company, providing a basis for a thorough survey of the material and supply situation. It discloses any overstocks and determines which is slow moving and obsolete stock and therefore should aid in the disposal of all obsolete stock and scrap. After an inventory has been properly prepared the accounting officer finds himself in a position to attract the at-

*F. W. Brownell, Puget Sound Power & Light Company, chairman. Mountain States Power Company: B. E. Lee. Northwestern Electric Company: Wm. M. Adam. Portland Electric Power Company: E. I. Snyder.

M33H 10,000 10-25-24

COMPANY _____ DIVISION _____

INVENTORY OF SUPPLIES _____ AS OF _____ 192__ SHEET NO. _____

Taken by _____ Priced by _____ Est. & Ft'gs by _____ Appr'd by _____ Verified by _____

CAT NO.	DESCRIPTION	ARTICAL FEET OR WEIGHT	RATE	PER	AMOUNT ACTIVE	AMOUNT INACTIVE

Fig. 2. Form of inventory sheet found effective.

should have determined the balance reflected in the control account as of the closing date of the inventory and be in a position to compare immediately the total of the inventory with the balance of the control account.

The work of inventorying should not stop here, however. A thorough investigation should be made to see that all charges and credits taken into account by the stores deparment prior to the closing date of the inventory have been carried to the control account, and likewise that all charges and credits to the control account have been taken into account by the stores department. Any discrepancies of this kind should be tabulated with direct reference to their source and should be added or deducted, as the case may be, to the balance of the control account, thus coming to a corrected balance to be compared with the total of the inventory.

In case there is a difference between the balance of the control account, or the corrected balance, and the total of the inventory, such difference should be thoroughly investigated with the view to finding the causes for it. This investigation, if necessary, should be carried to a thorough audit of all accounting affecting the control account since the date of the last inventory. While the difference involved may be small, it is recommended that this investigation be made to disclose any weaknesses in the stores accounting.

When the differences have been investigated and the accounting officer is satisfied with the results, a reconciliation statement should be set up, and proper adjusting journal entiries drawn. It is suggested that this reconciliation sheet and copies of the adjusting journal entries be made a part of the inventory. The inventory page upon which the reconciliation and adjustment are set forth should carry the approval of the accounting officer, the executive

officer or manager, the storekeeper and the chief clerk.

With proper supervision and direction the adjustment of the control account to the inventory in practically all cases can be recorded in the month's work directly following the inventory date. It is of importance that this be done, for immediate and prompt action in investigating and locating inventory differences is quite essential to good results. The inventory, when completed and the adjustment recorded, should be bound in suitable covers, properly labeled and filed as a part of the company records. It is generally advisable to make several copies of the inventory in order that they may be supplied to the various heads of departments to whom they may be useful and instructive.

House Cleaning

In order that the company may receive the full benefit to be derived from an inventory it is suggested that as soon as the inventory is completed and copies of it are available, the accounting executive arrange to have the heads of the various departments interested, together with the storekeeper and himself, visit the storeroom and go over the materials and supplies, item by item, in view of removing from the supply account and disposing of all materials and supplies on hand which are no longer used or useful in the business of the company.

This annual house-cleaning has a very beneficial effect in developing the interest of the various department heads in the company's investment in working capital. It also results in the conversion of materials no longer useful to the company into cash. In many cases, by the removal of such material from the storeroom, it relieves a congested situation and defers added investment in stores facilities.

Fixed Capital Committee Report*

The activities of this committee this year have been centered largely on the investigation of one phase of accounting for fixed capital. The National Committee on Fixed Capital Record Accounting this year took up the whole subject of fixed capital accounting by means of subcommittee investigations. To the Northwest Association committee there was assigned for investigation the question of "Detail of Distribution and Transmission System." Accordingly, the committee's activities have been largely limited to this special investigation.

The Northwest committee has not attempted to make definite recommendations on methods to be used by all companies regarding the details of records on their transmission and distribution systems, but have attempted only to make suggestions regarding these

* J. A. Rockwood, Portland Electric Power Company, chairman. Pacific Power & Light Company: J. C. Hawkins. Puget Sound Power & Light Company: H. L. McPherson.

records. The question is not as to what can be done, but what it is wise to do. It is possible to use so much energy and spend so much time on these records that their cost is out of proportion to their value. Consequently, the attempt has been made in this report to suggest a combination of records of maximum value at a minimum of expense.

Detail of Distribution and Transmission System

The question as to how far to go in the matter of records of light and power distribution equipment has long been a vexing one. The question is not what can be done, but what it may be advisable to do. On the one hand, there are certain minimum requirements with which every company must comply. On the other hand, it is possible to detail the cost of each individual pole, crossarm, insulator, etc., of the distribution system. An attempt will be made in this discussion to suggest a combination of records and

costs which will produce a maximum of usable information at a minimum of cost.

It is not our idea to make recommendations as to the methods that should be followed, but to give a few suggestions which might be of value to companies who are facing the question as to how far to carry distribution records. These suggestions are the result of experience gained from a practical test of the methods, after they have been tried out to a considerable extent.

It is necessary not only to record the details of installations, but to summarize that information both as to quantities and costs. With the large number of units of the same kind, which are not recorded individually, it is necessary to secure unit costs, and the only way to secure such unit costs is to combine the quantities and the costs.

It should be borne in mind that one of the most important uses for these figures is in the supplying of proper information for the retirement of property. Consequently, the suggested groupings have been made with this in view. The matters will be taken up under the property accounts of the uniform classification.

Transformers and Other Devices and Transformer Installation

A very satisfactory plan for dealing with transformers is to average all transformers of the same phase, voltage and size. With this plan it is necessary to secure periodically the number of transformers of similar phase, voltage and size added during the period; get the corresponding cost of these transformers and add both numbers and cost to the total of each group of the system at the beginning of the period. The resultant value, divided by the total number of transformers in that group, will then give the average value at which retirements should be made. In that way such a value is always available. An individual card record is necessary to keep track of the data regarding the transformer, its location, tests, etc., and that card record should agree with the summary of the cost record in quantities.

"Other Devices" charged to this account should have an individual record unless the quantity is sufficient to justify the method suggested above for transformers.

Table I illustrates the above method.

TABLE I.—Typical transformer segregation and classification. Primary 2,500-v., single-phase

5-kw. Transformers				7½-kw. Transformers			
	No.	Amt.	Avg.	No.	Amt.	Avg.	
Total 1-1-25.....	275	\$8,250.00	\$30.00	90	\$4,050.00	\$45.00	
Jan., 1925.....	8	249.92	31.24	3	131.25	43.75	
Total 2-1-25.....	283	\$8,499.92	\$30.03	93	\$4,181.25	\$44.96	
Feb., 1925.....	4	128.00	32.00	2	88.00	44.00	
Total 3-1-25.....	287	\$8,627.92	\$30.06	95	\$4,269.25	\$44.94	

The total value of the items should equal the total of the transformer account.

Meters

The method described above is especially adapted to the summarizing of meters where such large numbers are involved. The total number of meters in each group by type, size, voltage and wires should correspond to the summary of quantities in the costs. In this way it is practicable to know just of what the meter account is composed and where the property is located.

Poles and Fixtures

In order to summarize the costs and quantities of materials charged to "Poles and Fixtures" in a practical way, the suggestion is made that the more important units be selected to be treated as units and that the less important material be considered as installation material. For an illustration, the total value in this account may be treated under (1) poles by sizes, (2) crossarms by sizes, (3) guys and anchors. The cost of each complete unit would consist of (a) cost of the unit by itself, (b) material used in installation of that unit, (c) labor used in the installation of that unit, and (d) cartage. It is not proposed to ask men in the field to segregate labor under these

subdivisions. It is difficult enough to get proper segregations by major classifications. But it is quite possible to subdivide labor pertaining to this account between the units involved and do it as accurately as it would be done in the field.

Table II shows how this method may be applied.

This method of summarizing produces the necessary unit prices for the retirement of the principal classes of material. Minor items must necessarily be retired at prices in current use.

It is believed that the results thus obtained are as accurate in apportioning labor as would be secured from actual attempts to keep track of labor by the ordinary line foreman. The results attained by these methods have been tested out in actual experience in individual cases and they agree very closely.

Overhead Conductors

It is comparatively an easy matter to summarize conductors since the cost is so largely to be found in the bare cost of the wire. They can be grouped by sizes with the quantities in pounds or feet with their corresponding costs. Material used in installation can then be shown as installation material. Labor and cartage can be subdivided in proportion to the weight, as the cost of handling varies nearly always in proportion to the weight. Insulators can either be treated as installation material, excepting the expensive high-tension types, or separate divisions can be provided for them. Switches had better receive individual treatment unless they are so numerous as to justify treating them as a class and thereby averaging them.

Table III illustrates a method that may be used in summarizing conductors.

Overhead Services

Services are more difficult to summarize. It is quite necessary to know the average cost per service and also the average length per service. Yet since there are such wide variations it does not seem quite correct to retire any individual service at an average cost of services. Consequently, it seems the better way to summarize them by sizes of wire. The tabulation, though similar in form to that for overhead conductors, will be quite different in results because of the differences in installation.

Subway

There are many peculiar problems connected with subway costs which make them a difficult matter to handle. They are so largely out of sight and the conditions of their construction are seldom apparent. For that reason a more careful record is justified than in cases where construction is in plain view.

Ducts can best be carried by duct feet and averaged as such. Manholes can either be accounted for by their cubic capacity in connection with the cost of building them, or they may be handled individually. If the manholes are fairly well standardized, the averaging method probably will be satisfactory. Vaults and larger structures should be treated individually, if practicable. Handholes and distributor boxes can well be averaged.

An example may help to illustrate the methods:

Underground Conductors

Underground conductors can easily be summarized by sizes together with the cost of the cable, material used in installation, labor and cartage. Individual record should be kept of apparatus which may be considered a part of such conductors.

Underground Services

Underground services also present quite a problem. The services themselves are so widely different that an average cost means little. There are several reasons why an individual record should be kept of each service. Among such reasons are:

- (1) Information regarding the service in case of destruction by fire.
 - (2) In case of sale.
 - (3) Proper safeguarding such of company's property as may be on the property of a customer.
- On the other hand, when a service is retired, it is retired in the form of so much cable and so much pipe and other materials taken out. It depends largely upon local conditions as to what may be the best method of handling such records.

Table II.—Application of Poles and Fixtures unit classification method.

	Qna.	Unit Material		Instal. Mat.		Labor		Cartage		Total	
		Amt.	Per U	Amt.	Per U	Amt.	Per U	Amt.	Per U	Amt.	Per U
40-ft. pole.....	20	\$200.00	\$10.00	\$40.00	\$2.00	\$120.00	\$6.00	\$20.00	\$1.00	\$420.00	\$19.00
45-ft. pole.....	15	180.00	12.00	30.00	2.00	97.50	6.50	15.00	1.00	322.50	21.50
50-ft. pole.....	10	140.00	14.00	20.00	2.00	70.00	7.00	10.00	1.00	240.00	24.00
6-ft. c. arm.....	60	60.00	1.00	15.00	0.25	30.00	0.50	3.00	0.05	108.00	1.80
10-ft. c. arm.....	20	25.00	1.25	5.00	0.25	10.00	0.50	1.00	0.05	41.00	2.05
Patent anchors.....	3	12.00	4.00	3.00	1.00	6.00	2.00	1.50	0.50	22.50	7.50

TABLE III.—Example of Overhead Conductor summarization method.

	Qna.	Unit Cost		Instal. Mat.		Labor		Cartage		Total	
		Amt.	Per U	Amt.	Per U	Amt.	Per U	Amt.	Per U	Amt.	Per U
No. 2.....	1000	\$250.00	\$0.25	\$10.00	\$0.01	\$30.00	\$0.03	\$10.00	\$0.01	\$300.00	\$0.30
No. 4.....	500	120.00	0.24	5.00	0.01	15.00	0.03	5.00	0.01	145.00	0.29
No. 6.....	2000	500.00	0.25	20.00	0.01	60.00	0.03	20.00	0.01	600.00	0.30
Total.....	3500	\$870.00	\$0.249	\$35.00	\$0.01	\$105.00	\$0.03	\$35.00	\$0.01	\$1045.00	\$0.299
Type 12445.....	300	\$750.00	\$2.50	\$15.00	\$0.05	\$30.00	\$0.10	\$6.00	\$0.02	\$801.00	\$2.67
Type 2745.....	1	\$195.00	\$195.00	\$10.00	\$10.00	\$20.00	\$20.00	\$3.00	\$3.00	\$228.00	\$228.00
Pac. Elec., 21st & Main Sts.....											
Total.....		\$1815.00		\$60.00		\$155.00		\$44.00		\$2074.00	

TABLE IV.—Example of Underground Cost Classification.

	Duct Feet	Unit Cost		DUCTS		Labor		Cartage		Total	
		Amt.	Per U	Instal. Mat'l	Per U	Amt.	Per U	Amt.	Per U	Amt.	Per U
Main St., 1st to 3rd.....	550	\$44.00	\$0.08	\$55.00	\$0.10	\$66.00	\$0.12	\$11.00	\$0.02	\$176.00	\$0.32
1st & Main, 2nd & Main.....	2			\$250.00	\$125.00	\$300.00	\$150.00	\$20.00	\$0.10	\$570.00	\$285.00
Main bet. 1st & 2nd.....	3			\$90.00	\$30.00	\$135.00	\$45.00	\$6.00	\$3.00	\$231.00	\$81.00
Main St., 1st to 2nd.....		\$275.00	\$2.50	\$22.00	\$0.20	\$11.00	\$0.10			\$308.00	\$2.80
Bitulithic 110 cu. yds.....		\$150.00	\$3.00							\$150.00	\$3.00
Asphalt—50 cu. yds.....											
3rd & Main Sts.....				\$400.00	\$400.00	\$350.00	\$350.00	\$50.00	\$50.00	\$800.00	\$800.00

Accounts Payable Committee Report*

The activities of the accounts payable committee have been confined to the study of accounts payable problems of the smaller companies and the adaptability of tabulating machines to accounts payable.

At a group meeting held in Portland on Feb. 1, the advisability of using tabulating machines in accounts payable work was discussed at considerable length, along with other subjects.

Several companies in this section are using tabulating machines and are distributing their payrolls by

this method, as well as writing pay checks from tabulated reports, and, while none of these companies are using the machines in distributing vouchers to their sub-records, it was generally agreed that such a plan is feasible.

The reason for not accomplishing these latter named tasks by means of tabulating machines seems to be due to the fact that the companies now using tabulating equipment have their equipment loaded to capacity and that any further work will mean additional equipment.

This machine method is not recommended for small companies where volume is not cumbersome in any of the several phases of the work.

* F. H. Anderson, Puget Sound Power & Light Company, chairman. Pacific Power & Light Company: H. S. Gaylord. Portland Electric Power Company: G. W. Robertson. Utah Power & Light Company: R. H. Jones.

Accounts Receivable Committee Report*

This committee has confined its activities for the current association year to one subject with the idea in mind that concentration on one thing might enable it to accomplish something of a tangible nature; therefore, all our efforts have been expended in a study of customers' credits, particularly as directed to the new practice of "Interchange of credit information."

Our investigations disclosed that a few electric utilities and a large number of gas utilities situated in the extreme West and Northwest have already adopted the practice and that many companies are now se-

riously considering the matter. A hasty survey of the companies located in association territory divulges the following status of affairs:

Companies which have adopted the plan:

- Northwestern Electric Company, Portland, Ore.
- Portland Gas & Electric Company, Portland, Ore.
- Portland Electric Power Company, Portland, Ore.

Companies which have agreed to adopt the plan in the near future:

- Tacoma Gas & Fuel Company, Tacoma, Wash.
- Mountain States Power Company, Albany, Wash.
- Boise Gas Light & Coke Company, Boise, Idaho.
- Eastern Oregon Light & Power Company, Baker, Ore.
- Puget Sound Gas Company, Everett, Wash.
- Olympia Gas Company, Tacoma, Wash.
- Puget Sound Power & Light Company, Bellingham, Wash.
- Pocatello Gas & Power Company, Pocatello, Idaho.

* A. E. Janssen, Idaho Power Company, chairman. The California Oregon Power Company: C. A. Swigart. Portland Electric Power Company: W. H. Tillman. The Washington Water Power Company: V. G. Shinkle.

Companies now considering adoption of plan:
Pacific Power & Light Company, Portland, Ore.
Puget Sound Power & Light Company, Seattle, Wash.
Idaho Power Company, Boise, Idaho.

We have not had an expression from all the utilities located in Northwestern territory; therefore, the above list is somewhat incomplete. It is quite plausible to assume that a number of other utilities have the matter under consideration at the present time.

The committee believes that most companies are more or less familiar with the operations of the credit plan; therefore, exhaustive detail is unnecessary. However, for the benefit of those companies which may be uninformed, we are outlining briefly the plan below. Reference is also made to a very complete treatise on this subject by a committee of the Accounting Section of The Pacific Gas Association in its report and recommendations on credit and collections submitted at the annual convention held in Portland during August, 1925.

When a new customer applies for service he is required to supply the following information:

Utility reference:
Company
City
Address served.....
When served.....

Personal reference:
Name
Address
Occupation
Name
Address
Occupation

Commercial reference (charge accounts):
Business house
Address served
Business house
Address served

The above appears on the back of the application for service. The "utility reference" is secured in order that a questionnaire may be sent to the utility from whom service was last received in order to ascertain the credit standing of the customer with the other utility. We are submitting below a sample of a form of questionnaire ordinarily used.

(Face of letter form)

Portland Electric Power Company
General Offices
Electric Building

Portland, Ore.....192.....
App. No.....

To.....

Gentlemen:

We have received an application from.....
who claims to have been a customer of yours at.....
We would consider it a favor if you would fill in the information asked for on the reverse side hereof and return it to us in the inclosed stamped envelope. This information regarding applicant's past record will materially aid us, and will be considered confidential.

Yours very truly,

Creditman.

Members of National Electric Light Association.
(over)

(Reverse of letter form)

Name of applicant.....
Customer at.....
Customer for.....from.....to.....
(Nature of Account)
Was guarantee deposit required.....How much?.....
Were bills promptly paid?.....Is final bill paid?.....
How much is still due by applicant on old account?.....
Did account require notices?.....
Remarks

Date.....
(Signed.)

This gives the contracting company immediate access to the past record of the customer and, if it proves unsatisfactory, the company may then be on its guard and at the same time exact a deposit in such amount as it is permissible to demand under its rules and regulations. Quite frequently the questionnaire proves the means of aiding the company to whom it is addressed in securing payment of a balance which the customer owed at the time relations were severed with the previous company.

The elementary principles of the plan described are simple and yet elastic enough to permit modification to suit local conditions of any company. If, in conjunction with the adoption of this plan, the practice of demanding deposits is eliminated to a large extent, a considerable saving in clerical work will result. The time spent in writing deposit receipts, recording and refunding them, incidental checking and balancing of accounts regularly, computation and payment of interest, etc., is an item of cost which merits consideration. Moreover, it can be considered as an offset to the time spent in securing credit information, which itself would be compensated for by the elimination of losses due to lack of deposits. Contact with the customer would be established on a more pleasant and agreeable basis, which factor is also worthy of consideration.

Inasmuch as interest is paid on deposits, the mere possession of cash derived from customer deposits is of very little, if any, value. The value of this new plan is more or less dependent on the discontinuance of the practice of securing deposits at the time service is requested, and is probably more adaptable to residence accounts than to other classes of service. Industrial accounts must be carefully considered before the deposit is entirely eliminated.

There may be an impression that it will be necessary to form a separate credit department to place the plan in operation. Such is not the case, as the plan easily fits in to the regular routine of any office and requires no special department. The practice assumes particular importance in relation to merchandise activities, in which most companies are now engaged. Installment sales are steadily increasing and to insure ultimate collection of such accounts, the credit rating of the customer is highly desirable information.

The complete success of interchange of credit information among utilities hinges to a large extent upon the general adoption of the practice by all companies; however, the investigation of this committee develops the fact that there is some objection to the discontinuance of deposits by customers in view of the delay incident to confirmation of credit and that considerable antagonism might be stirred up among those customers whose credit would not be satisfactorily established. In view of this situation this committee has refrained from stating any definite conclusions, but it feels that the practice has sufficient merit to warrant further investigation by the new members of this committee during the ensuing association year.

Statistical Methods Committee Report*

In submitting this report it must be remembered pioneering this subject has been somewhat difficult, hampered as the committee was by the lack of interchange of views and the further fact that it had embarked upon a very involved and indefinite subject. However, with such opinions as were expressed at the February meeting and certain studies made, the committee makes the following recommendations as to the kind of statistics believed to be most desirable, together with definitions of the terminology contained therein. The manner of compiling the statistics, whether in numerical or graphical form, is left to the discretion of each utility.

It should be understood that all statistics refer to yearly totals, making the comparisons of one year with another cover a 24 months' period. For the sake of convenience these apply only to an electric utility.

Revenues

- (1) Gross from sales of electricity. (Total and by classes.)
- (2) Gross from other operations.
- (3) Gross per total kw-hr. sold and by revenue classes.
- (4) Gross per dollar of fixed capital.

Operating Expenses

Production

- (1) Expenses of steam and hydro plants (excluding current purchased.) (a/c 701 to 708.4 inc. National Association of Railway and Utility Commissioners classification of accounts.)
- (2) Kw-hr. generated by each.
- (3) Per kw-hr. generated.
- (4) Fuel costs of each plant,—total and per unit, barrel, ton or other measurement.
- (5) Fuel costs per kw-hr.
- (6) Load factor of plants.
- (7) Capacity of plants, (i.e., maximum hourly load).
- (8) Kw-hr. purchased.
- (9) Expense of current purchased.
- (10) Cost per kw-hr.

Transmission

- (1) Miles of line, different voltages.
- (2) Capacity lines carry. Maximum kw. designed for.
- (3) Operating expenses and maintenance.

Distribution

- (1) Number of meters.
- (2) Number of consumers by classes. (Power consumers should be segregated by industries.)
- (3) Kw-hr. sold to each class.
- (4) Connected load of each class.
- (5) Kw-hr. per consumer each class.

Utilization

- (1) Number of ranges in service.
- (2) Maintenance cost of same.
- (3) Cost of maintenance per range.

Commercial Expenses

- (1) Total commercial expenses.
- (2) Number of consumers.
- (3) Expense per consumer.

* Wm. H. Hawkes, Puget Sound Power & Light Company, chairman. D. F. McCurrach, Northwestern Electric Company, vice-chairman. Portland Electric Power Company: E. W. Moreland. A. H. Morris. The Washington Water Power Company: C. E. Gieseker.

New Business Expenses

- (1) Total new business expenses.
- (2) Gross electric sales.
- (3) Expense per dollar of sales.

General and Miscellaneous Expenses

- (1) Total expenses (excluding taxes).
- (2) All preceding expenses.
- (3) Per cent of preceding expenses.

Taxes

- (1) All taxes.
- (2) As a per cent of fixed capital.
- (3) As a per cent of gross sales.

Financial

Bonds

- (1) Net operating income.
- (2) Bond and other interest.
- (3) Number of times income equals interest.

Preferred Stock

- (1) Net surplus before depreciation.
 - (2) Preferred stock dividends.
 - (3) Number of times net surplus equals preferred stock dividends.
- Amount of outstanding bonds.
Amount of preferred stocks.
Amount of common stocks.

General Statistics—kw-hr.

Steam output.
Hydro output.
Purchased energy.
Total.
Sold to public.
Used by company.
Unaccounted for.
Total.
Maximum demand.
Load factor.

Fixed Capital

- (1) Production.
 - (2) Transmission (inc. substations).
 - (3) Distribution (inc. substations).
- Total.

Note:—Overhead and other indirect capital to be prorated to the above subdivisions so that the sum of these divisions equals the total capital as shown by records.

Disposition of One Dollar of Revenue

Best shown on a circular percentage chart, showing portion of one dollar utilized by the utility for fuel, labor, materials, taxes, interest, depreciation and dividends, the last two being combined in some utilities as surplus.

Definition of Terms

Gross Sales—The total amount billed to consumers, the collection of bills and discounts for prompt payment being an individual company matter.

Kw-hr. Generated—Kw-hr. recorded on station meters before deducting the amount used in station for company uses.

Transmission—Operating expenses and maintenance comprise accounts 731 to 731.54, inclusive.

Other terminology is self-explanatory.

While many other items could be reported, the above cover the principal phases of public utility operations generally called for in the many questionnaires solicited. We believe they should be of great value from the standpoint of uniformity and also for comparative purposes, which in the end is the matter of most importance.

Commercial Section Reports

Executive Committee Report*

The Commercial Section executive committee held its first meeting, after being organized, at Portland, Dec. 3, 1925, and all committees were represented. At

* P. M. Parry, Utah Power & Light Company, chairman. The California Oregon Power Company: W. M. Shepard. Idaho Power Company: J. F. Orr. Pacific Power & Light Company: V. H. Moon. Portland Electric Power Company: A. C. McMicken. J. D. Scott. Utah Power & Light Company: R. H. Ashworth. The Washington Water Power Company: L. A. Lewis. R. B. McElroy.

this meeting the various committee chairmen reported progress and outlined their plans for the report for the 1926 convention. After discussing the various committee subjects in considerable detail, the advisability and desirability of holding a mid-winter session in February was discussed to considerable extent. It was pointed out that the Commercial Section had never held a sectional conference and that there was a need for such a meeting at which informal discus-

sions could be held upon the various subjects involving the attention and consideration of commercial men and permitting of free exchange of ideas and experiences in handling various problems. The result of this was the meeting which was held in Spokane, Feb. 18-19, at which were present representatives from all the states in the Section and practically all of the central stations in them.

A definite program was prepared in advance in which each chairman of the various Commercial Section committees was asked to lead the discussion for his committee.

The address of welcome was given by V. G. Shinkle, secretary and treasurer of The Washington Water Power Company. Response was made by A. C. McMicken, sales manager of the Portland Electric Power Company, and the outline and purpose of the meeting was given by P. M. Parry, chairman of the Commercial Section.

Electric Refrigeration

The subject of electric refrigeration was discussed by Geo. C. Sawyer, sales manager of the Pacific Power & Light Company. Because this is one of the newer subjects a great deal of discussion resulted regarding the various angles of developing the electric refrigeration load, and a number of very good ideas for the advancement of domestic electric refrigeration, and sales methods used and found to produce satisfactory results, were brought out.

After a thorough discussion of this subject the following resolutions were adopted:

RESOLUTION

At the mid-winter conference of the Commercial Section of the Northwest Electric Light and Power Association held at Spokane, Wash., Feb. 18-19, 1926, a major part of the program was devoted to discussing ways and means of promoting the sale and use of domestic refrigerating equipment; and,

Whereas, It was the consensus of opinion that the ownership and use of domestic refrigerators by power company employees is vital to the sale of this equipment. Now, therefore, be it

Resolved, That the power companies and manufacturers cooperate to the extent of eliminating all items of profit and make possible the placing of domestic refrigeration equipment in the homes of company employees at actual manufacturers' costs.

Copies of the foregoing resolution have been sent to the principal manufacturers of domestic electric refrigerators.

RESOLUTION

To the Executive Committee of the Northwest Electric Light and Power Association:

Whereas, The Commercial Section of the association at its mid-winter conference in Spokane, Wash., Feb. 18-19, 1926, discussed, among other matters, the building of a domestic refrigeration load and its relation to the commercial ice industry, and

Whereas, The matter of advertising domestic refrigeration and its relation to the commercial ice industry was discussed. Therefore, be it

Resolved, That the Commercial Section recommend to the Executive Committee that it request all member companies advertising and selling domestic refrigerating equipment to so conduct their advertising and sales activities as to give the impression of promoting domestic refrigeration in general and not specify "domestic electric refrigeration" since this would immediately antagonize the commercial ice industry.

Other Committee Reports

Electric heating and cooking was discussed by Ross B. McElroy, chairman of that committee for this year, after which there was extended discussion, both as to methods of developing the business and as to the form of report to be prepared for the June convention.

The merchandising committee was represented by V. H. Moon, chairman, who compared the results of several campaigns which had proved successful in developing commercial and residential lighting loads. The experiences of a number of other companies represented were given, showing the methods adopted and the results obtained.

Power sales activities and new uses for power were discussed by J. D. Scott, chairman of the power committee, who reviewed the activities of his committee and outlined the various sources from which additional revenue might be secured. A discussion followed

which brought out the various methods and plans adopted by a number of companies in the securing of new power loads in connection with industrial heating and baking.

Rural electrification was discussed by L. A. McArthur, in which he described the development of rural electrification, with particular reference to Oregon, showing the progress of the National Committee's work along these lines. An extensive discussion followed, in which the activities in rural electrification in the Northwest Section were clearly brought out. The possibilities of the business were shown also, together with the probable estimated cost of securing complete electrification of the rural sections. Dean Edward C. Johnson, director of the experimental farm at the Washington State College, gave a very interesting paper describing the experiments conducted at the Washington State College in connection with farm electrification.

Range Survey Reported

Lewis A. Lewis, chairman of the committee on the subject, presented a report on the results obtained in the national electric range survey. A number of lantern slides were used to show the results of the committee's work to date, which gave the amount of load for various classes and combinations of service, including the range load, range and water heating load, and range, water heating and appliance load. The effect of such loads could be estimated for each company by superimposing such curves upon the load curves of any central station, thereby determining what effect this type of business would have upon that system.

L. R. Lefferson of the Electric Bond and Share Company, New York, gave a talk on rate making, showing the various types of rates applicable and explaining the theory of rate making in detail. The rate question was discussed generally, and the weaknesses and advantages of the various types of rates were brought out.

W. R. Putnam, representing E. W. Lloyd, chairman of the National Commercial Section, gave a talk on the activities of the national association and outlined the objects and aims to be accomplished during the year.

After the close of the two-day session, it seemed to be the unanimous opinion that the session had been well worth while and that many good ideas had been developed which could be taken home and put into practical use. The enthusiasm developed was undoubtedly carried back by those present and we feel sure that the result of this meeting will be a demand for similar meetings in the future at which free and informal discussions may be held regarding all topics covered by this Section.

The attendance at this meeting was approximately one hundred.

The Commercial Section was represented at the National Commercial Section meetings held in Chicago Oct. 13-14 and Jan. 14-15.

Committee reports have been prepared for presentation at the Spokane convention as follows:

Electric Cooking and Heating Committee: Ross B. McElroy, chairman, The Washington Water Power Company, Spokane, Wash.

Power Committee: J. D. Scott, chairman, Portland Electric Power Company, Portland, Ore.

Domestic Electric Refrigeration Committee: J. F. Orr, chairman, Idaho Power Company, Boise, Idaho.

Merchandising Committee: V. H. Moon, chairman, Pacific Power & Light Company, Portland, Ore.

Transportation Committee: R. H. Ashworth, chairman, Utah Power & Light Company, Salt Lake City, Utah.

Electric Range Survey Committee: Lewis A. Lewis, chairman, The Washington Water Power Company, Spokane, Wash.

The above includes all committees with the exception of the Customers' Relations Committee. A. C. McMicken, chairman of this committee, felt that there was nothing new to be developed in a report for this year because of the fact that the work of this committee so closely followed, and in fact apparently duplicated, the work of the Public Relations Section Committee in many ways. It was therefore decided that for this year no report would be made.

Domestic Refrigeration Committee Report*

The report submitted by the domestic electric refrigeration committee of this Section for 1925 dealt with this subject as related to our territory in considerable detail. The committee recommends the careful study of this report and it also recommends for study the report on preservation of food, as given by Mr. McLay, a member of the electric refrigeration committee of the National Electric Light Association for 1925. This report should be read and studied by everyone interested in the sale of domestic refrigerators.

We are quoting the more general part of this report:

The chief object of refrigeration is to prevent the spoiling of foods, and in order to lay a proper foundation for its study and fully appreciate its importance to man's welfare, we should first investigate the causes leading to spoiling, decomposition and decay.

It is only since the invention of the microscope we have learned that by far the most numerous and widespread of all living things are minute colorless plants called micro-organisms or microbes. They are found everywhere—in the water, in the air, in the soil, and on all growing and living things. They require for their food the same material as man and a constant warfare exists between the two for its possession.

There are many kinds of microbes. Though called plants, many are like animals in that they possess the power of locomotion. Some actually are animals, e.g., the Protozoa. Some are harmful to human health and are called disease germs. These, however, are comparatively few in number because very few microbes live in a healthy living animal. Many are useful. The delicate flavoring of butter and cheese is due to the action of certain micro-organisms, also the seasoning of meat. Others cause the raising of bread and the fermenting of liquors. They all contribute to the decomposition and final decay of dead organic matter, reducing it to the dust and soil to form the elements for new growth. The various kinds of microbes are always at war among themselves for the possession of food, and the kind of spoiling which occurs will usually indicate which group won. They multiply with enormous rapidity, and it is only this antagonism, and various other influences which prevent them from devouring all things and then dying themselves for lack of food.

Microbes, in their normal state, exist as small unicellular colorless plants; they also exist in the so-called "resting stage," a condition analogous to seeds of our larger plants. The normal growing microbe can easily be killed by pasteurization, that is, subjection to a temperature of 140 deg. to 160 deg., but the one in the resting state is harder to affect and will sometimes withstand pasteurization temperatures for a long time. Many of them multiply merely by elongating and dividing into two, as often as every 20 or 30 minutes. Others form "spores" something like seeds of larger plants. These spores have a high resistance to heat and cold. They are floating about everywhere and when one falls into fertile soil—organic matter with plenty of moisture and warmth—it immediately becomes active, grows and commences to propagate its kind.

The function of refrigeration is to prevent growth or multiplication of microbes, since they will not grow at low temperatures. They are not destroyed, however, by cold and will immediately become active and grow and multiply again when the temperature is increased.

Sales Manual

The central stations of the Northwest as do others throughout the country realize the value of the domestic refrigerator load and are all much concerned in ways for increasing the sales of this machine. It is for this reason that this committee has been interested in the preparation of a domestic refrigeration sales manual that can be used by those engaged in selling this class of service. Many of the refrigerator manufacturers have put out a course in salesmanship, and while these deal largely with the sale of a particular line of merchandise, yet the committee recommends that anyone engaged in selling electric refrigeration would do well to enroll in one of these courses.

Selling refrigerators consists of selling an idea and not necessarily a machine, and the best success can be obtained if sales efforts are preceded by an educational campaign. To successfully sell refrigerators, then, means that we must adopt some educational plan that will reach our customers. Some companies have been successful in using a selected mailing list, others in general newspaper and billboard advertising.

Co-operation with Architects and Builders

It is to be noted that the tendency in designing modern homes is to provide kitchens of limited size, the cabinet type kitchen being most generally used.

Inspection of many new buildings under construction reveals the fact that in a great many instances, even in homes of the better class, practically no space is left in the kitchen, or immediately adjoining the kitchen, for a refrigerator of suitable size.

This committee feels that member companies could well address letters to the architects and builders in their respective territories calling attention to the tremendous growth of electric refrigeration for the home now taking place, which growth is destined to continue in the future, and request that in designing and building homes ample space be allowed, preferably in the kitchen, for the placing of a refrigerator.

It should also be borne in mind that the average householder, when installing an electric refrigerator, will provide a refrigerator of larger capacity than when using ice, and due regard should be given to this phase of the situation.

Builders and architects should be advised that the cabinet effect in the kitchens they plan may be preserved and refrigeration properly cared for by building a standard make of refrigerator into the wall of the kitchen, allowing the back of the refrigerator to extend into a hall or closed-in back porch. Their attention should be called, of course, to the fact that when refrigerators are built into the wall, the bottom of the refrigerator should be raised at least eighteen inches above the floor to provide greater convenience. They should further be advised of the desirability of carrying a drainage pipe from the refrigerator to the outside, or connecting it to a permanent drain, in order that defrosting may take place without inconvenience.

This committee believes that with but few exceptions builders should purchase refrigerators of standard make and known efficiency, rather than attempt to build them themselves.

In some sections of the country, builders are not only building refrigerators into the kitchen, but are installing electrical units as well. An excellent opening for the sales department in this connection exists undoubtedly.

Rates

It is found that a wide disparity of rates exists in connection with home electric refrigeration and that ideas of the rate departments of various central stations are widely at variance as regards proper classification of this type of business. This committee believes that considerable discussion might be engaged in to advantage on this subject particularly during the early stages of development as it is obviously difficult to make any major adjustments after a large amount of this business has been secured.

Some companies feel that refrigeration business should be taken on the regular combination lighting and cooking rates, which means, of course, that all of the refrigeration consumption would be on the low step. These companies feel that the customer develops into a high load factor customer and is entitled to his excess kw. hours at a low rate. Other companies feel that the value of the service rendered by a domestic refrigeration unit is far above this low step rate, and are of the opinion that some method must be devised to bill the customer at a price commensurate with the value of the service, either through additional steps in existing rates for customers using refrigeration, or if necessary, through an additional meter at a special refrigeration rate. These are matters which should receive the early consideration of member companies.

Cost of Servicing

Considerable reference has been made to discussions of refrigeration servicing costs and to various reports on the subject that have been compiled from time to time.

This committee calls attention to the fact that in compiling figures on the cost of servicing due consideration must be given the fact that the late types

* J. F. Orr, Idaho Power Company, chairman. Pacific Power & Light Company: G. C. Sawyer. Puget Sound Power & Light Company: R. W. Clark. Utah Power & Light Company: H. M. Ferguson. The Washington Water Power Company: J. F. Farquhar.

of machines are giving far less cause for trouble than the earlier models. It is obviously not fair, in giving consideration to servicing and costs as a basis for future activity, to take into consideration the costs on all of the older machines in service.

Regard should also be taken of the fact that many companies choose to make a periodic inspection of all machines in service even though many of these visits do not result in adjustments of any sort. This expense, of course, can well be charged to development of this class of business, but cannot fairly be charged as cost of servicing in the event that no actual servicing takes place. It is the belief of this committee that if these points are given due consideration it will be found that the cost of servicing per machine per year will show a lower figure than has been submitted in a number of reports.

Some information has been obtained in response to questionnaires sent out to central stations operating in this division relative to service costs and kw-hr. consumption of the domestic refrigerator. These data, however, are practically the same as set forth in the report of the committee last year. At the present

the association urge its member companies to conduct their selling and advertising campaigns so as not to antagonize the commercial ice manufacturers and that none try to build domestic refrigeration load at the expense of the commercial ice industry.

Domestic Refrigeration Record and Service Data

Consumer

Address

City

Location of Unit

Model

Serial No.

Type of Condenser

Tank No.

Type of Pan

Pan Pulls Inches

Size of Motor H. P.

Motor Mfr.

Motor No.

Motor Pulley Inches

Compressor Pulley

Belt Size and Material

Installed by

Date

Make of Refrigerator

Total Cu. Ft.

Condition

In use

Years

Ice Compartment Width

Depth

Height

Meter Installed

Date

Date

Nature of Trouble

Cost of Material And Labor

Amount Billed Consumer

Fig. 1. Recommended uniform data card.

time there seem to be no uniform records being kept. This makes it impossible to secure data on service cost on a comparable basis. A suggested form of service and installation card was made by the committee last year and it is recommended that a uniform data card be adopted by all central stations of the Northwest. A suggested form is that which follows:

At a recent meeting of the Commercial Section of this division two resolutions were adopted in the interest of furthering the sale of electric refrigeration.

It was felt that a great hindrance to the promotion of the domestic refrigerator might be removed if a considerable number of the officials and employees of the central stations would use this appliance in their own homes, and it was agreed that the manufacturers of ice machines should offer some inducement which would assist in making this possible. The other resolution recommends that the executive committee of

Electric Service Company	Residential Customers	Ranges in Use	Present % Saturation	% of Ranges Sold with Water Heaters	Kw-hr. used Monthly by Range	Are Ranges sold at Mfg. List Price?	Discount Offered For Cash	Lowest Down Payment	Maximum Months of Payment	Use of Premiums	Forms of Advertising Used	Most effective Advertising Used	Ranges Sold Installed	Makes of Ranges Sold	Believe in Campaigns?	Duration	How Many per Year	Cooking Rate per kw-hr.	Practice followed in selling Apartment Houses Ranges	Do you believe in other stores selling ranges?
A.....	61,867	7,000	11.3	18.0	150	Yes	5%	\$15.00	31	Yes	Newspaper Billboards Demonstrations	Demonstrations	Yes	Hotpoint Westinghouse Acorn	Yes	30 days	3 or 4	2c	Cost plus 15%—25% Down, 24 Payments. Connect to customers wiring.	Yes — with proper coaching.
B.....	12,000	3,263	27.2	12.0	125	Yes	5%	\$14.50	18	Yes	Newspaper Billboards Demonstrations	Newspaper	Yes	Universal Westinghouse Acorn	Yes	6 weeks	4	2c	12 or more sold at 15% above cost — 10% Down, balance 50 monthly payments.	Dealers are paid 15% commission — Dept. stores do not adhere to selling plans. Furniture stores just becoming active. Our experience is not satisfactory.
C.....	30,361	2,421	8.0	50.0	142	No	5%	\$10.00	18	Yes	Newspaper Billboards Demonstrations	Newspaper	No	Hotpoint Westinghouse Acorn	Yes	60 days	2	3.6c net	4 or more sold at 15% above delivered cost — Terms: 12 months, 5% charge.	Our experience is not satisfactory.
D.....	73,192	8,000	10.9	None	104	Yes	10%	\$5.00	24	No	Newspaper Billboards Demonstrations	Newspaper	No	Hotpoint Westinghouse Acorn	Occasionally	.....	.....	2.7c net	Large groups at laid down cost plus delivery. Terms: 2 years.	Yes — other stores selling ranges must serve same.
E.....	23,000	5,860	25.5	33.0	127	Yes	10%	\$5.00	24	Yes	Newspaper Billboards Demonstrations	Newspaper	No	Hotpoint Westinghouse Acorn	Yes	30 days	4	2c	Additional quantity discount offered.	No.
F.....	33,000	7,033	21.3	97.0	122	Yes	10%	\$4.00	24	Yes	Newspaper Billboards Demonstrations	Newspaper	Yes	Westinghouse Hotpoint	Yes	6 weeks	2	3c	Customer pays complete cost plus carrying charges and does all wiring. Terms: 12 months. We would service on this basis.	Would like to have stores selling ranges of approved make but not same ranges sold by us.
G.....	78,000	10,000	12.8	25.0	115	No	5%	\$10.00	18	Yes	Newspaper Billboards Demonstrations	Newspaper	Yes	Westinghouse Hotpoint Acorn	Yes	60 days	2	2c	Cost plus 5%. Terms: 24 months.	Terms: No.

Table I.—Summary of questionnaires returned by seven power companies in Northwest geographic district. Part of report of Electric Cooking and Heating Committee appearing on following page.

Electric Cooking and Heating Committee Report*

The electric range and water heating committee held two meetings during the past year. The first was in Portland on Dec. 4, 1925, and the last in Spokane, Feb. 18, 1926.

When it is considered that the development of the electric range load has been an operating and merchandising problem before us for many years it appears that a comparison of methods used in building this load, and the progress that has been made, would be worthy of considerable study. In analyzing the comparative report, which is a summary of questionnaires returned by seven of the power companies in this geographic district, it is remarkable how closely in agreement they are in regard to individual range sales policies. See Table I on preceding page.

Territorial Saturation

The seven companies reporting serve 311,420 residential customers of which 43,582 are electric range users, a range saturation of 14 per cent. This percentage of saturation varies from 8 per cent to 27.2 per cent. Assuming 50 per cent range saturation, a reasonable figure to approach, most companies are only fairly started on range load building.

Electric Range Monthly Kw-hr. Consumption

Since most companies do not meter the electric range separately these figures are simply the closest approximation. The average monthly use of 126 kw-hr. appears reasonable. This figure multiplied by the particular rate that applies shows what the range is worth to a company as a revenue builder. The cooking rate as shown in the summary varies from 2 to 3.6¢ per kw-hr. In most cases these amounts are the lowest step of the combined lighting and cooking rate.

Selling Plans

Nearly all of the companies reporting sell electric ranges at the manufacturers' list price and terms

* R. B. McElroy, The Washington Water Power Company, chairman. Idaho Power Company: G. H. Davis. Northwestern Electric Company: J. B. Buman. Pacific Power & Light Company: G. C. Sawyer. Portland Electric Power Company: H. A. Joslin. Puget Sound Power Company: R. W. Lindley. Utah Power & Light Company: R. M. Bleak.

with 5 or 10 per cent discount for cash. The terms of monthly payments usually are extended over approximately 24 months. All the companies believe in a small down payment and the majority favor selling the range completely installed ready to use.

Newspapers, billboards, broadsides and demonstrations are the forms of advertising generally employed by most companies. The newspaper is favored as the most effective method. Two or three short campaigns of from 30 to 60 days each is the popular way to sell the range by most companies, at which time the use of a premium is considered effective.

That the power company should carry two lines of electric ranges is unanimous yet some carry five or six lines, probably due to local conditions.

All companies reporting sell ranges to apartment houses in quantities of four or more at approximately cost price plus a carrying charge for deferred payments.

The sale of ranges by electrical dealers, department stores, furniture stores, hardware stores, etc., seems to be a question that has as many different opinions as there are power companies. However, the predominating thought is that this class of dealers is not at present prepared to sell the electric range and service it as desired by most electric service companies.

Electric Water Heating

Most companies sell the electric water heater but do not insist upon the purchase of a heater at the time the range is installed. From the customer's viewpoint, the flat-rate charge for this service seems most popular. This committee regrets that it did not have the opportunity to make an exhaustive study of high-wattage metered-water-heating service, but this was impossible because so few of these water heaters now are in use in the Northwest. The committee hopes that this study as outlined by the Commercial National Section will be undertaken at the earliest possible date.

This report is presented by the committee with the desire that some phases of the electric range and water heating load will be of value to all concerned.

Electric Range Survey Committee Report*

Editor's Note: This constitutes a summary of N.E.L.A. reports No. 25-41 and No. 256-38, both of which may be obtained from the National Electric Light Association, 29 West 39th Street, New York, N. Y. In this brief review only the salient features of the committee's final report are presented. Copies of the complete report will be distributed free of charge at the Spokane convention of the Northwest Electric Light and Power Association.

With the increasing popularity of the electric range and the increasing willingness on the part of central stations to furnish this service, there has arisen a necessity for the determination of certain data which will enable the allocation of that part of a utility's investment in plant, transmission and distribution facilities properly chargeable to range load. In order to arrive at this figure an extensive series of tests is required to furnish data from which proper deductions can be made. With reliable and authentic information at hand it is felt that those electric service companies that have been more or less reluctant to encourage the use of electric ranges will be able to apply the data to their own systems and from it work out a plan, so that ultimately electric cooking will become universal.

In order to obtain the necessary data the electric-range survey committee was appointed as a sub-committee of the national cooking and heating committee. Funds to finance the survey were provided by the electric range manufacturers in co-operation with the

N.E.L.A. On account of development of the electric range load in the Pacific Northwest the task of making these tests was assigned to the Northwest Electric Light and Power Association. The committee originally appointed in the fall of 1923 has been working almost continuously since that time on various phases of the tests. The actual tests upon which the present and final report of this committee is based were made during the period from March, 1925, to February, 1926.

Where Tests Were Made

The work of the committee has been confined to the making of a series of tests on 150 ranges in two different localities, an urban and a rural community. The tests covered three seasons of the year for each community; the urban tests being for spring, summer and winter with the fall omitted since it was believed that the spring tests would be comparable with the fall tests. The rural tests covered the seasons of summer, fall and winter.

The city of Spokane, Wash., was chosen as representative of an average urban community. With its high density of electric range load it was believed to be extremely ideal for the particular tests to be made. Spokane with a population of some 115,000 is one of the principal cities of the Northwest, with the manufacture of wood products as its chief industry. In that city the residential consumer's service is supplied through one meter. This single meter registers the consumption of energy used for lights, appliances and

* L. A. Lewis, The Washington Water Power Company, chairman. Idaho Power Company: F. J. Rankin. Puget Sound Power & Light Company: M. T. Crawford. The Washington Water Power Company: L. R. Gamble.

the electric range. The water heater is on a flat rate and is connected to the service ahead of the meter.

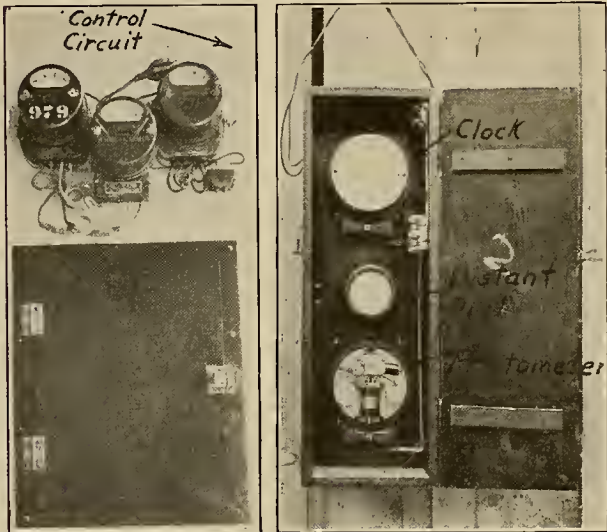
The towns of Payette, Idaho, and Ontario, Ore., were chosen as being representative of the average



Typical street in Payette, Idaho, showing types of homes where surveys were made.

rural community and also because of their location with respect to each other, making it easy to test 150 ranges without covering too much territory. Payette has a population of 2,500 and Ontario, 2,000. The two towns are about four miles distant and situated on opposite banks of the Snake River. The consumers on the outer edge of these towns are chiefly farmers on small irrigated fruit ranches. The consumers in the towns themselves are owners and clerks in the stores, professional men and retired farmers.

The rate schedules of the central station serving this territory require three separate meters, one on the range, one on the lighting service and one on the water-heater service. The difference in rates for each service makes it advantageous for the consumer to



Meters and panel board in Payette home (left). Distant dial set showing clock, dial and printometer (right).

use his appliances such as electric irons, toasters, etc., on the range circuit. Therefore the range tests, in general, reflect the demand and kilowatt-hour consumption for the range and heating appliances while the lighting tests give these factors for lighting and appliances which use small amounts of power. It is felt, however, that the range peak is very little affected due to such small heating appliances being rarely used when the range is in service.

Method Used in Making Tests

The procedure followed in making the tests is known as the distant-dial method. The distant dial is an instrument by means of which the energy registered on any number of watthour meters is totaled. This dial, which is actuated through a low-voltage direct-current control circuit, may be placed at any reasonable distance from the watthour meters. For purposes of accuracy only ten watthour meters were connected to each distant-dial set, making 15 sets of instruments necessary.

Standard watthour meters were used in making the tests. These were equipped with commutator-type reversing switches to actuate the distant dial.

Since the distant dial in itself does not have any time-interval element it was necessary to equip it

with contacts so that a printometer could be installed and the demand in kilowatts obtained. The printometer with its auxiliary, a Warren motor-driven contact-making clock was used for this purpose. The clock had a 15-min. demand interval.

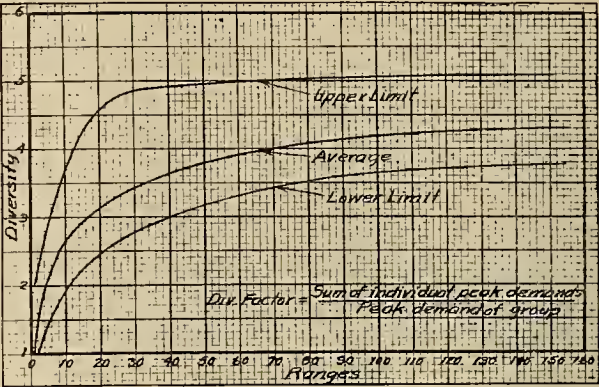


Fig. 1. Curve showing diversity factor for electric ranges.

During the time of each seasonal test the following demands were recorded:

- 1. Range demand.
- 2. Water-heater demand.
- 3. Lighting and appliance demand.
- 4. Total residential demand.

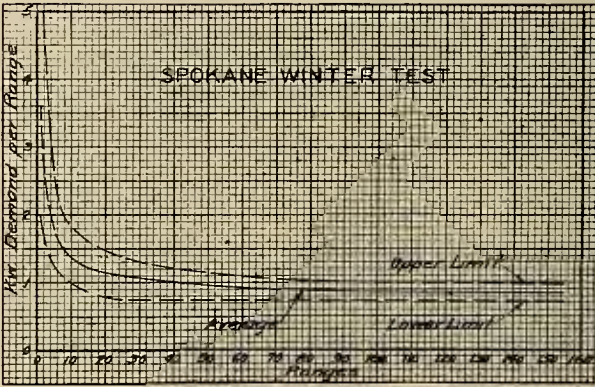


Fig. 2. Curve showing the kilowatt demand per range for urban winter conditions.

The following time was allotted for the individual tests:

Range test.....	14 days
Cutting meters to water heater circuits.....	3 days
Water heater test.....	7 days
Cutting meters to lighting and appliance load	3 days
Lighting and appliance load test.....	7 days
Cutting meters to total residence load.....	3 days
Total residence load test.....	7 days
Total.....	44 days

Upon the completion of the tests the committee was able to arrive at certain deductions and to present results giving definite information regarding the characteristics of the electric range load. In its conclusions no attempt is made to determine whether or not the electric range load is a profitable business, since this is beyond the scope of the work assigned to the committee. However, it is expected that the information secured by the committee will furnish the electrical industry as a whole the fundamentals upon which to base an analysis. With a foundation on which to build, any electric service company then can apply the constants of its particular system and deduce results for use in solving the problem of the rate to be charged to make the range load pay. Such rates, of course, can be expected to vary for different sections of the country and in many instances will be influenced by the cost of cooking by other methods.

It can be seen readily that the committee cannot go into the matter of whether or not the electric range load is profitable, because of the large number of variable factors that enter into the problem and each factor having a different weight and value for each individual utility. Therefore the committee has attempted to supply only those fundamentals which will remain practically constant under all conditions.

Conclusions*

With the data made available by the field survey of electric ranges the following facts have been determined:

1. Average peak demand for one electric range in either urban or rural communities is approximately 3.61 kw. The maximum peak demand is approximately the connected load of the range.

2. Power demand per range for groups of 50 ranges to groups of 5,000 ranges is from 0.950 kw. to 0.700 kw. for urban communities, and from 1.000 kw. to 0.712 kw. for rural communities.

3. Power demand per range for a certain number of ranges in a group does not vary perceptibly for the two types of communities or for the seasons of the year. In the urban territory the power demand per range for a group of 150 ranges varies from 0.88 to 0.84 kw. The lower demand was obtained from the winter test. For the rural community the power demand varies from 0.87 kw. to 0.83 kw. The lower demand was obtained from the summer test.

4. Typical range-load curves for both communities show three distinctive peaks, one in the morning, varying from 7:30 to 8:00 a.m., one at noon, and one in the evening, varying from 5:30 to 6:00 p.m. In the urban community the evening peak is the greatest for all seasons of the year, the morning and noon peaks being from 50 to 65 per cent and 45 to 60 per cent respectively of the evening peak. The evening peak comes between 5:45 and 6:00 p.m. during all seasons of the year except the winter season, then it comes 15 min. earlier. In the rural community the noon and evening peaks are about equal, the noon peak generally being the largest for all seasons. The morning peak is from 60 to 70 per cent of the noon or evening peak.

5. Due to the fact that in the temperate zone the days are considerably shorter during the winter months it was found that the lighting peak moves forward and tends to coincide with the range peak. The lighting peak for both communities during the winter occurs between 6:15 and 6:30 p.m. Although this is somewhat later than the range peak it is found that there is 74 per cent of the range peak on, for the urban community, and 60 per cent of the range peak on, for the rural community, at the time of the lighting peak. During the range peak between 94 and 98 per cent of the lighting peak is on for the urban and rural communities respectively.

6. Power demand per range at the time of the winter lighting peak in urban territory is 0.62 kw. per range based on 150 ranges and in rural territory 0.50 kw. per range.

7. Average annual power consumption per range for both communities is practically the same, varying between 1,500 and 1,600 kw-hr.

8. Average peak demand for any one light-and-appliance consumer in either urban or rural territory is about 0.600 kw.

9. Power demand for a group of 150 consumers in an urban community during the winter season is 0.242 kw. per consumer and in a rural community is 0.174 kw. per consumer.

10. Power demand per consumer for light and appliances during the winter range peak in urban territory is 0.230 kw. based on 150 consumers and in rural territory on the same basis is 0.168 kw. per consumer.

11. Average annual power consumption per light-and-appliance consumer is about 375 kw-hr., for each community.

12. Although the following data on water-heater loads are conclusive as far as the type and size of water heater are concerned, the committee is anxious to emphasize the fact that they are not representative of the entire water-heater situation since only heaters

of low wattage were tested. The maximum size in any instance was but 1 kw. It is understood that further tests will be run during the coming year involving water heaters of larger capacities. The tests of this committee supplementing those to be made will provide data upon which to make more definite conclusions. The water heaters in Spokane are on a flat

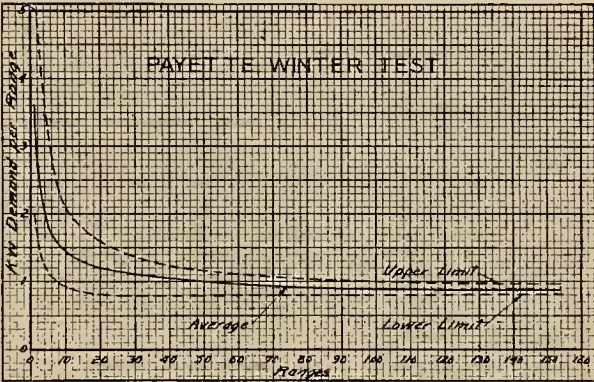


Fig. 3. Curve showing kilowatt demand per range for rural winter conditions.

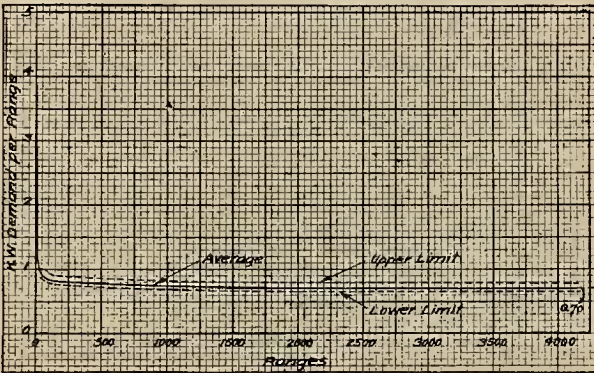


Fig. 4. Curve showing the kilowatt demand per range up to 5,000 ranges.

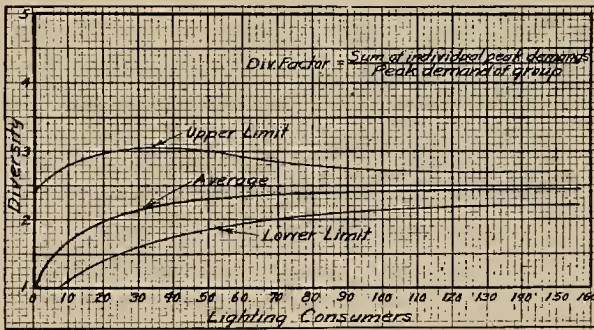


Fig. 5. Curve showing the diversity factor for a group of lighting consumers.

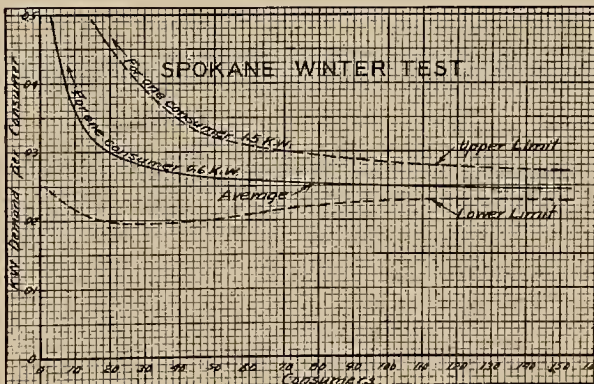


Fig. 6. Curve showing the kilowatt demand per consumer for lights and appliances for urban winter conditions.

* Note: The demands given throughout this report are at the consumer's service switch so that when such demands are referred back to the points of supply the losses in transmission must be added. All reference to lighting and appliance load should be taken to mean the residential load exclusive of the range and water heater.

rate and so connected to the range service that the heater is off when the range ovens are used. The tests show the demand per heater, on the basis of 150 heaters, to be 0.761 kw., with practically no diversity for larger numbers of heaters. The demand at the time of the evening range peak is 0.599 kw., for 150 heaters, dropping to a demand of 0.540 kw. for 5,000 heaters.

Water heaters in Payette are on a metered rate with no arrangement made for taking them off the circuit when the range is in use. On the basis of 150 heaters the power demand per heater is 0.75 kw. There is some diversity due to the metered rate and for a group of 5,000 heaters the demand per heater falls to 0.695 kw. The demand at the time of the noon range peak, on the basis of 150 heaters, is 0.585 kw. per heater. There is some diversity here also and it is found that the demand per heater for a group of 5,000 is 0.538 kw. No curve was computed for the water-heater demand at the evening range peak, but calculations show that the diversity will be the same as in the case of the noon peak although it was found that the water-heater peak generally is lower at that time of day.

13. Diversity factors for ranges were found to be as follows:

10 ranges.....	2.65
20 ranges.....	3.13
30 ranges.....	3.42
40 ranges.....	3.63
50 ranges.....	3.78
75 ranges.....	4.05
100 ranges.....	4.18
150 ranges.....	4.30
1,000 ranges.....	4.85
5,000 ranges.....	5.15

14. Connected load of the range has no material bearing upon the peak demands created by a group of ranges. This is evident from the fact that the peak demands in the two communities were the same, while the urban connected load averaged 7.140 kw. to the rural connected load of 5.744 kw. per range.

15. Power demand per consumer during the winter season for a group of 150 consumers without water heaters is 1.06 kw. for urban districts and 1.008 kw. for rural districts. With water heaters these values are 1.57 kw. and 1.528 kw. respectively.

16. Demands recorded during the tests were for ranges, etc., that were in active use. There were some consumers who, during the period of the tests, did not consume any energy and therefore were not included in arriving at the demand. Based upon 150 consumers it was found that the active consumers were about 98 per cent of the total under test.

17. Range peaks may be expected any day of the week except Saturday or Sunday.

18. Load factors for the various types of service on a weekly basis for a 15-min. period are as follows:

For ranges in urban territory.....	16 to 18 per cent
For ranges in rural territory.....	21 to 23 per cent
For lights and appliances in urban territory	25 to 32 per cent
For lights and appliances in rural territory	18 to 26 per cent
For total load without water heater in urban territory.....	21 per cent
For total load without water heater in rural territory.....	23 per cent

Method of Applying Data Obtained

In order to apply the data obtained from the survey the central station desiring to supply a service for electric cooking first must obtain certain load curves from the system, namely, the individual feeder load curves, the substation load curve and lastly, the generating-station load curve. With these curves at hand, which, by the way, should be for such days as are representative of the annual peak conditions of the various subdivisions of the service, the utility should set a figure as to what number of new electric range consumers it will attempt to serve, say, after a period of five years. The number of range consumers determined, the next step will be to add to the feeder-load curves the range-load curve for the number of

ranges expected to be taken care of by each particular feeder. (See Fig. 7.) Should the water heater be

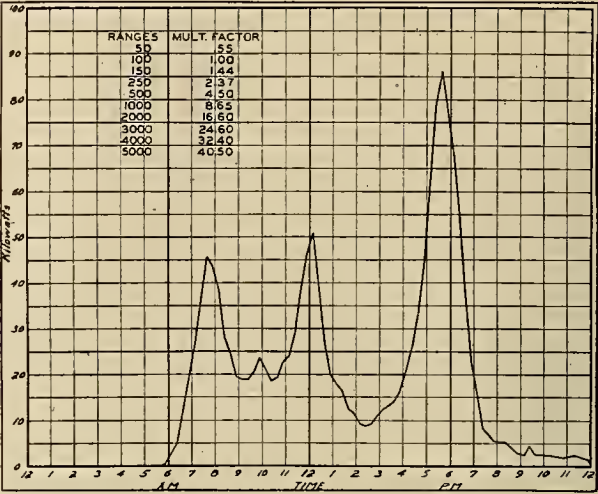


Fig. 7. Typical electric range load curve for an urban community for 100 ranges with multiplication factors for groups of from 50 to 5,000 ranges.

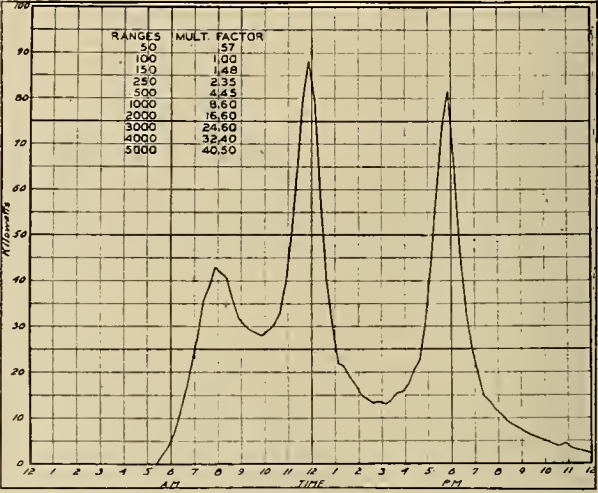


Fig. 8. Typical electric range load curve for a rural community for 100 ranges with multiplication factors for groups of from 50 to 5,000 ranges.

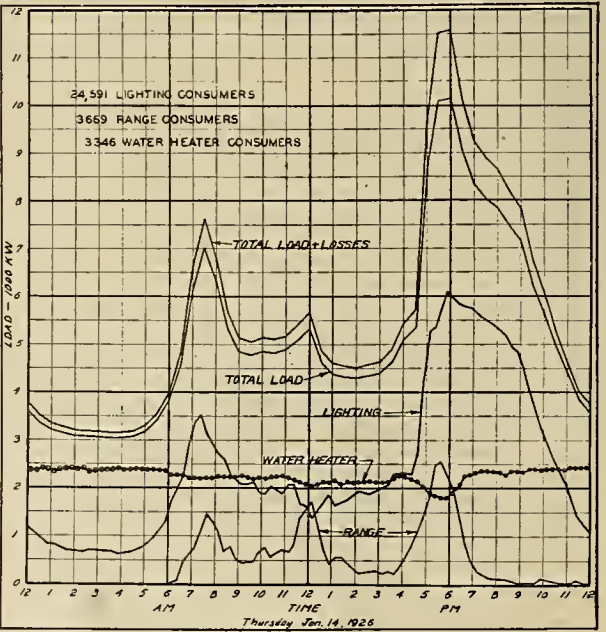


Fig. 9. Lighting feeder load curves for Spokane, Wash., for typical winter day showing relation of component parts and various peaks.

planned as a part of the new range load then its load curve also should be added. Since the demands as shown on the curves are at the consumers' premises, the distribution losses must be added. These losses

TABLE I.—Average maximum demand of an electric range.

Place	Number of ranges tested	Average maximum demand
Spokane.....	45	3.67 kw.
Payette.....	63	3.56 "
	108	3.61 kw.

will vary according to the distribution-system efficiency and each utility will have a value or percentage loss which it has determined for itself. With the new feeder-load curve then available it will be possible to arrive at the additional investment required in distribution facilities.

TABLE II.—Average maximum demand of lights and appliances.

Place	No. of lights and appliance consumers tested	Average max. peak	Average max. evening peak
Spokane.....	30	0.673 kw.	0.523 kw.

The total number of ranges and water heaters supplied by all the feeders is of course known and it is necessary again to refer to the typical range and water-heater load curves to determine the typical load

TABLE IV.—Connected load.

Appliances	Spokane		Payette	
	Number per Consumer	Connected Load per Consumer (Watts)	Number per Consumer	Connected Load per Consumer (Watts)
Range.....	1.000	7,140	1.0	5,744
Water Heater.....	1.000	814	0.693	967
Vacuum Cleaner.....	0.715	125	0.726	127
Washing Machine.....	0.605	121	0.680	132
Flat Iron.....	0.978	587	1.015	610
Percolator.....	0.314	126	0.435	173
Waffle Iron.....	0.270	162	0.380	228
Air Heater.....	0.234	140	0.346	208
Sewing Machine.....	0.138	13.8	0.240	24
Grill.....	0.022	13.2	0.167	100
Heating Pad.....	0.117	58.5	0.140	70
Toaster.....	0.474	237.0	0.413	206
Refrigerating Machine....	0.022	4.4	..	..
Fan.....	0.037	3.7	0.346	34.6
Ironing Machine.....	0.051	76.5	..	..
Curling Iron.....	0.474	71	0.453	68.0
Lights.....	25.0	1,000.0	15.9	635
Total Watts.....	..	10,603.1	..	9,326.6
Watts without Range and Water Heater.....	..	2,740.0	..	2,615.6
Persons per family.....	3.44	..	3.62	..
Maids.....	0.16	..	0.027	..
Rooms per house.....	6.10	..	5.68	..

curve at the substation for all the ranges. The distribution losses are added and this curve added to the substation load curve to give the total substation capacity required. The difference between the new capacity and that already available determines the additional investment in substation facilities. The same procedure is followed on through to the generating station and a figure is derived at last representing the additional investment in the entire plant to serve the new range load.

The total investment in the property to serve industrial, commercial, residential and range load then is known and the problem becomes one of allocating to each service its part of the investment and share in operating and maintenance expenses. The proper allocation is an open question and may vary considerably for each electric service company but with the costs finally proportioned to the satisfaction of those concerned a rate can be devised. If its value proves to be such that the public will avail itself of the new type of service there can be no question that the service should be rendered.

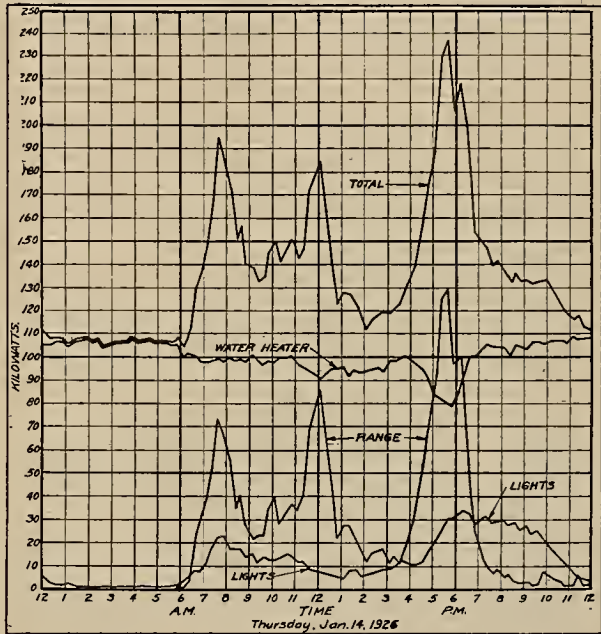


Fig. 10. Load curves for 150 range consumers, Spokane, Wash., for typical winter day.

TABLE III.—Load data (based on 150 consumers).

Equipment	Season	Spokane				Payette			
		Per consumer		Kw-hr. per week	Per cent load factor	Per consumer		Kw-hr. per week	Per cent load factor
		Connected load-kw.	Peak kw.			Connected load-kw.	Peak kw.		
Range.....	Spring	7.14	0.87	24.4	16.7	5.744	0.83	29.5	21.2
Range.....	Summer	7.14	0.88	23.7	16.0	5.744	0.87	33.2	22.7
Range.....	Fall	7.14	0.84	25.6	17.5	5.744	0.87	30.7	21.0
Range.....	Winter	7.14	0.84	25.6	17.5	5.744	0.87	30.7	21.0
Light and Appliances.....	Spring	2.740	0.200	8.46	25.2	2.616	0.100	2.99	17.8
Light and Appliances.....	Summer	2.740	0.200	8.46	25.2	2.616	0.100	2.99	17.8
Light and Appliances.....	Winter	2.740	0.246	12.85	31.1	2.616	0.172	7.38	25.6
Range, Lights and Appliances.....	Winter	9.88	1.06	37.8	21.2	8.36	1.008	38.2	22.6
Water Heater.....	Summer	0.814	0.761	112.5	88.0	0.967	0.750	76.0	60.3

Merchandising Committee Report*

The merchandising committee has chosen for the main subject of its report the sale of commercial lighting service by campaign methods. This report includes two complete campaigns for the promotion of commercial lighting operated by different companies in territories of different character. Both campaigns were successful although the methods used and results obtained vary to a considerable extent.

Campaign No. 1 was operated by The Washington Water Power Company in Spokane, a city of 129,000 inhabitants. The illuminating engineer of that company was directly in charge of the activity and every effort was made to make the campaign self-supporting.

Campaign No. 2 was operated by the Pacific Power & Light Company in all of its branches which take in 15 towns varying in population from 1,500 to 2,500. The campaign was conducted by the merchandising department of that company with the object of increasing commercial lighting revenues at as low a net cost to the company as possible.

A brief summary of the results of both campaigns follows:

Campaign Number One

Operated by: The Washington Water Power Company.
Where: Spokane, Wash.
When: Sept. 21 to Oct. 17, 1925.
Total population of community in which campaign was conducted: 129,000.
Number of commercial lighting units sold: 589.
Load added to company's lines: 85 kw.
Estimated annual revenue secured: \$3,200.
Net cost of securing above revenue: \$253.81.
(Note: All items of expense incurred in the campaign were included in the above. These expenses are shown in the cost summary of that campaign in the following pages.)
Cost per kilowatt of load added: \$2.98.

Campaign Number Two

Operated by: Pacific Power & Light Company.
Where: At its branches in Oregon, Washington and Idaho.
When: Oct. 13 to Dec. 16, 1925.
Total population: 105,000.
Number of commercial lighting units sold: 1,374.
Load added to company's lines: 235.61 kw.
Estimated annual revenue secured: \$11,280.50.
Cost of securing above revenue: \$3,369.54.
(Note: All items of expense incurred in the campaign were included in the above. These expenses are shown in the cost summary of that campaign in the following pages.)
Cost per kilowatt of load added: \$14.27.

Commercial departments at times have been criticized for estimating probable increases in annual revenue at too high a figure. In order to determine exactly what were the results of this campaign activity an analysis was made of 65 representative accounts where commercial lighting units had been sold. This analysis compares the kw-hr. consumption and bills rendered to 65 customers for the months of January, February and March, 1925, with the months of January, February and March, 1926.

The following are the results of the comparison taken from the company ledgers:

Total kw-hr. billed for first three months of 1925: 55,005.
Total kw-hr. billed for same three months of 1926: 71,004.
Increase in kw-hr. consumption: 15,999.
Percentage of increase: 29.
Total kw. increase in connected load due to campaign for above customers: 31,350.
Cost of obtaining this business, based upon average campaign cost: \$447.36.

Based on an average kw-hr. cost of 5 cents, the actual increase in kw-hr. sales to these customers over a period of three months was nearly twice as much as it cost to secure the increased business.

Carrying the calculations further, if it is considered that the increased revenue for the first three months was entirely the result of the increased load and equal to one-fourth of the yearly revenue, it would appear that the new business secured is worth better than \$100 per kw-yr. to the company. Undoubtedly this is

a higher figure than is received for this class of service and may be explained by the fact that there is a tendency to use all of the connected load now more than before the new load was added. Regardless of the cause of the increase in kw-hr. consumption, and corresponding revenue to the company, records show that the increases in the short period of three months more than justified the cost of obtaining this new business.

Campaign No. 1

Abstract Report of Commercial Lighting Campaign of Washington Water Power Company: Selling commercial lighting fixtures on a campaign basis is something new to the central stations of the Northwest. The campaign conducted by The Washington Water Power Company from Sept. 21 to Oct. 17 (four weeks) is believed to be the first one attempted in this part of the United States.

The campaign was a success judging from the results and compared to anticipated benefits. A canvass of the 2,200 commercial establishments in Spokane netted a sale of 589 lighting units after all cancellations were deducted. Lighting equipment was sold to 208 customers in nearly every line of business. However, the grocer was the best prospect, accounting for the sale of 109 units to 40 grocers. The central station is interested primarily in the load-building possibilities of different appliances. From this standpoint the commercial lighting unit compares favorably with the much larger and more costly appliances. The actual connected load of all lighting equipment sold and installed was 190 kw. or an average of 320 watts per fixture. The increased wattage over the old equipment was about 85 kw. which will produce an added revenue of at least \$3,200 per year. This revenue of \$40 per kw-yr. compares quite favorably with the electric range in dollars per kw. of demand, a point not ordinarily considered with a lighting load.

The cost of selling this merchandise was slightly more than the selling price due to the comparatively large amount spent for newspaper advertising. However, this expenditure has proved to be of great value in spreading general information about better lighting to merchants and their customers. A considerable number of requests for units and for advice received since the campaign by the illuminating engineer can be traced to this advertising.

The following cost summary is quite accurate but it was thought best to include an item of \$50 to cover small expenses not regularly billed.

Cost Summary

Item	Cost	Cost Per Unit
1. Fixtures and installation of same.....	\$4,536.39	\$7.69
2. City inspection charge.....	102.50	0.18
3. Advertising, demonstration store displays, printing and photographs.....	1,555.92	2.64
4. Cancellations, cost of installation and removal	35.35	0.06
5. Commission for sale	883.50	1.50
6. Miscellaneous expense (estimated)	50.00	0.09
Total cost	\$7,163.56	\$12.16
Cash selling price.....	6,909.75	11.73
Difference.....	\$ 253.81	\$.43

Item No. 1 includes, besides the cost of the merchandise, the electrician's charge for installation. This was slightly in excess of 75 cents per unit due to some extra work required before fixtures could be installed. No wiring was done by the company but \$726.50 worth was installed by the electricians employed. This business amounted to \$1.23 per unit and was more profitable than at first expected.

Item No. 2 is 50 cents per customer less three orders going outside the city.

Item No. 3 includes the following schedule of newspaper advertising:

Morning Paper531 in.
Evening Papers593 in.

Three demonstration stores were equipped with fixtures and a show window decorated and properly

* V. H. Meon, Pacific Power & Light Company, chairman. California Oregon Power Company: W. M. Shepard. Northwestern Electric Company: J. C. Plankinton. Portland Electric Power Company: J. L. White. Puget Sound Power & Light Company: R. W. Clark. The Washington Water Power Company: R. B. McElroy.

lighted during the campaign. The demonstration stores were a great help to the salesmen who could show a prospect just what his neighbor had done to improve lighting. Other demonstration stores were equipped with fixtures only. Two multigraphed letters were sent out, each with a return postcard, to a selected list of about 3,000 names. These letters were personally addressed by typewriter and signed in ink. Many answers were received to both letters and nearly every customer answering was sold. The expense of sending out these letters and post cards was only about 4 cents each.

Item No. 5 is based upon a straight commission of \$1.50 per unit which was paid to seven of the salesmen, the other five being on a straight salary basis. These latter men carried on their regular duties as well as canvassed for this campaign. However, the commission would represent about 60 per cent of their salaries, which is liberal. Prizes were offered for a team selling their quota of 375 units. The highest commission was \$96 for selling 64 units. The domestic appliance business was good during the month so that the earnings of each salesman on commission was much better than usual at that time of year.

Campaign No. 2 Plan of Operation

Organization.—Because of the fact that the campaign on store lighting was run concurrently with the annual washing machine sale in October and a campaign on ironing machines in November, the work was done by a separate organization.

The district manager was in charge of the store-lighting campaign in each locality. It was necessary for him to devote considerable of his time to its supervision.

A special crew of ten men trained in commercial lighting was secured for soliciting commercial lighting business. This crew was divided into five teams of two men each and the campaign was started simultaneously in five districts on the company's system. The lighting salesmen reported directly to the district manager and all reports of sales and solicitation received the district manager's O.K.

- District managers were asked to:
1. Arrange for a model lighting installation to be made in one store prior to the opening of the campaign.
 2. District managers placed our proposition before the representative contractor-dealers of their districts and secured their co-operation. The names of the dealers participating with us appeared with our own in the announcement advertisement which appeared at the beginning of the campaign.
 3. District managers were asked to see that Survey Cards were properly filled out and information as to the customers' previous bills furnished the salesmen.
 4. District managers were asked to supervise the mailing, at the proper times, of the three broadsides which comprised our direct-mail advertising program.
 5. District managers saw that daily reports on form furnished were submitted by the salesmen and copies forwarded promptly to the Portland office.

Quotas.—Each district was assigned a quota based upon the number of commercial lighting customers in that community:

Town	Units
Astoria	80
Dayton-Waitsburg	50
Goldendale	20
Hood River-White Salmon	60
Lewiston	100
Pasco-Kennewick	70
Pendleton	60
Pomeroy	25
Prosser	25
Seaside	25
Sunnyside	55
The Dalles	75
Toppenish	55
Walla Walla	125
Yakima	175
	1,000

Model Stores.—It was part of the plan that in each district where the commercial-lighting campaign was to be held a model store-lighting installation be completed prior to the opening of the campaign. In other words, the plan was to have a conspicuously located store lighted with our units to show prospective customers the results they might expect in their own establishments. In order to be sure of having such a store a very liberal proposition was made

to some merchant in each town, the merchant to be selected by the district manager based upon the location of the store and the credit of the merchant. To one such merchant in each town the offer was to light his establishment as it should be lighted, without any responsibility on his part. If, after the installation had been made at company expense, the merchant wished to retain the installation, he could pay for it on the same basis as was offered the other merchants in the community. In this connection it was suggested that if possible the window lighting of the model store should be handled as well as the interior lighting. The company was prepared in this case to finance the wiring and equipment necessary for proper window lighting together with the fixtures for interior illumination. If it was possible to do the windows as well as the interior of the model store, full advantage was taken of the opportunity for colored lighting and spot lighting. District managers were cautioned that the model store installation would be an item of considerable expense to the company. The manager weighed very carefully all factors before making his selection of the merchant whose store was used as a model.

Co-operation with Contractor-Dealer.—It seemed at first glance that the proposed campaign on commercial lighting went further into the province that always had been considered as belonging to the contractor-dealer than any activity the company ever had sponsored. The company is not as a rule in the fixture business, but if the plan were to be a success it was of first importance that the hearty co-operation of every representative contractor-dealer in the community be gotten. It was the aim to obtain this co-operation and contractor-dealers were offered the following:

1. During the time of the commercial-lighting campaign contractor-dealers were furnished with stock of units featured in the campaign.
2. Contractor-dealers were allowed and in fact urged to sell these units during the campaign. The contractor-dealers were paid \$3.50 for each unit sold and installed by them.
3. Contractor-dealers were paid \$1 for each unit installed by them when it was sold by the company.
4. When a contractor-dealer made a sale to a customer on time the company financed the sale providing the opportunity to pass on the prospect's credit was available.
5. In addition to financing the time contracts for the purchase of lighting fixtures, the company offered the contractor-dealers who engaged in this campaign additional financial assistance. It was believed that there would be considerable wiring necessary in re-lighting stores. The company was prepared to finance such wiring contracts as were entered into as a result of re-lighting a store, and carried such a contract along with the contract for the lighting units. It was necessary to charge 10 per cent as a carrying charge in this case. This was charged to the consumer and the net amount of the wiring contract paid in cash to the dealer by the Pacific Power & Light Company. The selection of dealers to do additional wiring or installation of units was left to the district manager. In many instances the customer had a preference and his wishes were consulted.
6. Two salesmen, who were on the company payroll, were placed in the district and were glad to offer their services to any contractor-dealer co-operating in the sale of commercial lighting units. This help, which was freely given the contractor, in no way affected the amount of commission due him.
7. An announcement advertisement was used in the daily papers, approximately one-half page in size. The names of all contractor-dealers co-operating in the campaign appeared with that of the company under this large announcement advertisement.

All that was asked from the contractor was that the standards of illumination intensity outlined by the company be followed and that the company have an opportunity to pass on each installation sold and installed by the contractor. It was believed that the organized effort of all persons interested along one line would produce infinitely more business for all than single activities which might be conducted by individual contractors.

Survey Cards.—Each district was furnished a sufficient quantity of survey cards to cover their list of customers taking current under schedule B, or other metered commercial-lighting schedules. These survey cards were sent into the district prior to the opening of the campaign.

Cards were filled out and kept in account-number order so that they could be used for solicitation purposes. Attached to each survey card was a sheet giving a record of the prospect's commercial lighting account. This sheet showed monthly bills for the past year, the kw-hr. consumed per month and the

average cost per kw.-hr. of electricity used.

It was important that the information be furnished on the survey cards and that the analysis of the account be given to the salesman as the salesman probably would have to answer a good many statements which could not have been well handled if he had not had specific information with him.

It was not necessary that the entire group of commercial-lighting customers' accounts be analyzed at once. It was estimated that not more than 20 calls per day would be made during the campaign. If the accounts were analyzed by account numbers so that the information would be kept a few days in advance of the salesman's requirements, that was all that would be necessary. This would spread out the work over a longer period and relieve the burden somewhat.

Some sort of file was furnished to keep the survey cards and analysis sheet together. After cards and sheets were used for purposes of solicitation they were returned to the file with notations as to what had happened and were used for call-backs and future reference.

Direct-by Mail Advertising.—The direct-by-mail advertising employed during the campaign consisted of three pieces:

Broadside No. 1.—This was a green broadside and on the inside of the first fold said: "Why not employ tongue-tied clerks—you could probably hire them for less."

Broadside No. 2.—This was a red broadside of the same size as No. 1. Inside of the first fold was the following: "More people buy by sight than are induced to buy by argument."

Broadside No. 3.—This was printed in yellow and black and on the outside the heading was: "A sensational offer to Business Men."

Broadside were mailed in the rotation of their numbers given above and at intervals of two days. It was apparent that the first two broadsides were general in subject matter and simply conveyed the thought of profiting with light without offering any specific method of obtaining this profit. The third broadside gave our proposition as a means of realizing this additional profit. The last of the series of three broadsides reached the prospect not more than two days in advance of the salesman's call. It was apparent that the mailing of these broadsides must be so timed that this would be accomplished.

The three broadsides mentioned above were sent out in accordance with account numbers. The survey cards were used for guidance, a notation having been made on the back of the survey card when each broadside was mailed.

It was not advisable to mail broadsides too far in advance of the call of the salesman. It was estimated that approximately ten calls per day actually were made; therefore, only 10 broadsides per day were mailed out.

Report Forms.—Daily reports were required from the sales teams in the various districts. Report forms were furnished in sufficient quantity so that the original could be sent into the head office, one copy retained by the salesman and a third given to the district manager for his files. Salesmen were asked to give complete information on all reports turned in. The district managers were urged to see that this information was complete and that no sale be reported on these forms until it had been finally approved by the accounting department.

The report form had, on its reverse side, a space for listing the wiring contracts which had been entered into by our customers purchasing the lighting units. A complete record of such contracts as were to be financed by the company was kept and reported.

Prize Plan.—In order to stimulate sales, prizes were offered to the teams making the best showing. The following list of five prizes, totaling \$250.00, was paid to the teams as outlined.

\$50 to the team having to its credit the greatest number of sales by Oct. 17.

\$50 to the team making the most sales between Oct. 17 and Oct. 31.

\$50 to the team making the most sales from Oct. 31 to the end of the campaign.

\$50 to the team making the highest percentage of sales in any single district on that district quota.

\$50 to the team making the most sales during the entire campaign.

School for Lighting Salesmen.—A school for lighting salesmen engaged for the commercial-lighting activity was held in Portland during the week of Sept. 28-Oct. 3.

The operating company, the lamp manufacturer and the jobber each furnished one instructor who devoted his entire time to the school for commercial-lighting men for that week. Each salesman received a quantity of literature on the subject of illumination.

A ft.-candle meter also was available at the meeting and its method of use explained to the salesmen. While it probably would not be necessary to use a ft.-candle meter continuously it was thought advisable for all men engaged in selling the units to be familiar with its operation.

Final instructions were given the salesmen in regard to their work on such subjects as co-operation with contractor-dealers, re-calls, distribution of advertising materials, prices and reports.

Personal Cards.—Each salesman soliciting commercial-lighting business was furnished with business calling cards designating him as a representative of the company. The card bore on the face the slogan "Profit with light—pay with the profits."

Cost Analysis

Total units sold.....	1,374	\$17,359.25
Commission to dealers.....		\$1,487.50
Installation by company.....	949.00	
Advertising	426.35	
Cost of lamps.....	732.00	
Salaries	3,622.42	
Expense accounts.....	2,486.35	
Miscellaneous expense.....	100.00	
Broadside, etc.....	347.33	
Postage, broadsides.....	240.00	
Glassware and hangers.....	9,837.84	
Total cost.....		\$20,728.79
		—\$ 3,369.54

Load Increases Secured Through Kitchen-Lighting Campaign

In order to secure an actual check on the effect of the kitchen-lighting campaign on residential kw.-hr. consumption, an analysis was made of a hundred representative residential accounts for a period of one year prior to and one year after the installation of the kitchen-lighting units in the homes.

The following figures, obtained as outlined above, should be of interest to member companies:

Average yearly consumption of 100 representative residential accounts prior to the installation of the kitchen-lighting units.....	256 kw.-hr.
Average yearly consumption of 100 representative residential accounts after the installation of the kitchen-lighting units.....	323 kw.-hr.
Average yearly gain.....	67 kw.-hr.
Average yearly revenue gained at 5 cents per kw.-hr.....	\$3.35
Average monthly consumption prior to the installation of the kitchen-lighting units.....	21.4 kw.-hr.
Average monthly consumption after the installation of the kitchen-lighting units.....	27 kw.-hr.
Average monthly gain.....	5.6 kw.-hr.
Total gain.....	26%

In selecting the accounts for the above analyses an attempt was made to cast out any accounts where the consumption was known to have been increased by other means. It is believed that the increases shown above can be attributed almost entirely to the installation of the Daylight kitchen unit.

Power Committee Report*

After careful consideration of the field of possible subjects to be investigated, the power committee felt that it could well direct its efforts toward reviewing the industrial heating and heavy duty bake-oven situation in the Northwest. The general idea, we believe, is that these committee reports should be made primarily for the purpose of helping the various member companies of our association to learn what "the other fellow" is doing and thereby improve their own methods.

Whether we realize it or not, all central stations are tied together in the public mind and the policies and rates operative in one city have their effect upon every other city in the district. Especially is this true since large syndicates are establishing or acquiring control of branch businesses in all our larger cities. Mergers in theatres, door factories, foundries, chain stores, bakeries, ice cream plants, office buildings, etc., always result in the local managers of the plants trying to force down the utilities' rates to equal the lowest rates granted in any city in the territory. It behooves us, therefore, to standardize our practices as much as local conditions will warrant and above all to eliminate poor rates and methods of business getting that react to the detriment of the central station industry as a whole.

The following typical examples are picked from the records of the utilities operating in the larger cities of this district and will serve as a basis for comparison and discussion:

Examples

1—Classification: Steel foundry.

Equipment installed: One 3-ton Electromelt furnace.
Connected load: One 3-phase 1,500-kva. transformer.
Maximum demand (measured): 1,600 kw.
Steel melted per month (average): 300 tons.
Energy used in 12 months: 1,627,200 kw-hr.
Average per month: 135,600 kw-hr.
Net rate earned: 1c per kw-hr.

2—Classification: Foundry.

Equipment installed: One-ton "Greene" furnace.
Connected load: Three 250-kva. transformers.
Maximum demand (measured): 785 kw.
Steel melted per month (average): 280 tons.
Energy used in 12 months: 1,476,000 kw-hr.
Average per month: 123,000 kw-hr.
Net rate earned: 0.98c per kw-hr.

Method of securing business: Business was obtained by helping the plant manager to get cost and operating data on the furnace. It took two years' steady effort to induce this firm to install the furnace and even then it would not do so except on six months' trial with option to reject furnace at no expense to itself if it proved unsatisfactory.

3—Classification: Bakery, doing a general baking business, including bread, rolls, cakes, pies, and pastry.

Connected load: Oven, lights and small power, 163 kw.
Maximum demand (measured): 158 kw.
Output: No data available.
Energy used in 12 months: Ovens, lights, power, 384,000 kw-hr.
Average per month: 32,000 kw-hr.
Net rate earned: 1.19c per kw-hr.

Method of securing business: Power company financed purchase of oven for the customer while the manufacturer guaranteed its performance. Terms allowed customer on \$6,000 purchase price were: 20 per cent initial payment on delivery of oven and balance in eighteen equal monthly instalments plus 6 per cent interest on deferred payments.

In comparison with Example (3), another large bakery using gas fired ovens consumed in 12 months, 315,100 kw-hr. for light, power and the charging of electric delivery trucks, on a demand of 97 kw., earning a net rate of 1.64c per kw-hr. This firm will not install electric ovens because of the high loss incident to junking its present ovens.

A word of explanation regarding the demand feature of the following four examples might be opportune at this time, inasmuch as confusion might result in making comparisons. The oven and light consumption is figured on a commercial light rate where the demand of the oven is disregarded and the light demand only used. This allows the customer the benefit of the lower steps in the rate schedule, so that most of the oven consumption comes at 3c, 2c and 1½c steps. The minimum charge, however, is based on the total connected load.

4—Classification: Bakery doing general baking business including bread, cakes, pies and pastry.

Connected load: Ovens, lights 390.61 kw. Power 37.02 kw.
Demand: Ovens and lights (assessed): 6.88 kw. Power, 24.75 kw.
Energy used in 12 months: Oven and lights 817,500 kw-hr. Power 80,484 kw-hr.
Average per month: Oven and lights 68,125 kw-hr. Power 6,707 kw-hr.
Net rate earned: Ovens and light, 1.075c. Power 2.127c.
Method of securing business: Power company financed purchase of ovens for customer while manufacturer guaranteed performance.
Discussion: Installation included two-deck ovens of 80 kw. capacity each and one full traveling oven 220-kw. capacity. A material saving in labor was effected. (Capacity of output, 4,000 loaves per hour.)

5—Classification: Baking cookies only.

Connected load: Oven 50 kw. Power and lights, 21.51 kw.
Demand: Oven (assessed): .2 kw. Power and light, 16.53 kw.
Energy used in 12 months: Oven 108,000 kw-hr. Power 8,733 kw-hr.
Average per month: Oven 9,000 kw-hr. Power 962 kw-hr.
Net rate earned: Oven 1.368c. Power 4.281c.
Method of securing business: Power company financed purchase of oven for customer, while manufacturer guaranteed performance. Help was given in designing the oven to meet customer's needs.
Discussion: Cost per dozen cookies baked, all classes, was 1/5c. Labor saving of oven pays for entire power bill. Continuous traveling electric oven was used, replacing rotary gas oven.

6—Classification: Bakery doing bread baking only.

Connected load: Oven and lights 51.17 kw. Power 5.34 kw.
Demand: Oven and lights (assessed): 1.17 kw. Power 4.80 kw.
Energy used in 12 months: Oven and lights 141,576 kw-hr. Power 9,108 kw-hr.
Average per month: Oven and lights 11,798 kw-hr. Power 759 kw-hr.
Net rate earned: Ovens and lights 1.318c. Power 3.615c.
Method of securing business: Power company financed purchase of oven for customer while manufacturer guaranteed performance.
Discussion: 50-kw., two-deck oven used. Satisfaction of customer has resulted in using oven more than anticipated because of performance, although there is an oil burning oven standing alongside the electric.

7—Classification: Retail bakery doing general baking business, including bread, cakes, pies and pastry in a suburban district.

Connected load: Ovens, light and power 12.46 kw.
Demand (assessed): Ovens, light and power .46 kw.
Energy used in 12 months: Ovens, lights and power 23,832 kw-hr.
Average per month: Ovens, light and power 1,986 kw-hr.
Net rate earned: Ovens, lights and power 2.515c.
Method of securing business: Co-operated with manufacturer in sale of oven.
Discussion: 12-kw., two-deck oven, the average size for the small retail baker in outlying districts.

8—Classification: Steel foundry.

Connected load: 500 kw. transformer.
Measured demand: 327 kw.
Steel melted per month (average): 95 tons.
Energy used in 12 months: 980,000 kw-hr.
Average per month: 81,700 kw-hr.
Net rate earned: 0.85c per kw-hr.

9—Classification: Steel foundry.

Connected load: 450-kva. transformer.
Measured demand: 400 kw.
Steel melted per month (average): 85 tons.
Energy used in 12 months: 750,000 kw-hr.
Average per month: 62,500 kw-hr.
Net rate earned: 0.88c per kw-hr.

10—Classification: Car shops.

Connected load: No data.
Measured demand: 1,040 kw.
Steel melted per month (average): 105 tons.
Energy used in 12 months: 1,470,000 kw-hr.
Average per month: 122,500 kw-hr.
Net rate earned: 0.83c per kw-hr.

11—Classification: Annealing furnace.

Connected load: 490 kw.
Measured demand: 273 kw.
Output, annealed parts per month: 76 tons.
Energy used in 12 months: 605,000 kw-hr.
Average per month: 50,400 kw-hr.
Net rate earned: 1c per kw-hr.
Working temperature: 475 to 500 deg. F.

12—Classification: Bakery, all classes of work.

Connected load: No data.
Measured demand: 76 kw.
Energy used in 12 months: 239,000 kw-hr.
Average per month: 20,000 kw-hr.
Net rate earned: 1.7c per kw-hr.
Output: 2,500 loaves bread, 60 cakes, and 40 gals. sweet goods per day.

*J. D. Scott, Portland Electric Power Company, chairman. R. W. Faville, G. B. Walker. The Washington Water Power Company. W. T. Ryan, E. E. Scofield. Puget Sound Power & Light Company. T. H. Gibbs.

13—Classification: Bakery; bread and cakes.
 Connected load: 45 kw.
 Measured demand: 45 kw.
 Energy used in 12 months: 193,000 kw-hr.
 Average per month: 16,000 kw-hr.
 Net rate earned: 1.5c per kw-hr.
 Output: 1,400 loaves bread and 150 lb. cakes per day.

14—Classification: Bakery; bread, rolls and pastry.
 Connected load: Oven and mixer motor 45 kw.
 Maximum demand (metered): 30 kw.
 Energy consumed in 12 months: 84,260 kw-hr.
 Energy consumed average month: 7,022 kw-hr.
 Average monthly bill: \$117.10.
 Average rate earned: 1.66c per kw-hr.
 Output: Baker states that average monthly output would be equal to 57,200 1-lb. loaves.

15—Classification: Bakery; bakes large variety of cakes, rolls, cookies, bottom bread and miscellaneous pastries, using oven on average of 16 hours per day.

Connected load: Oven only 40 kw.
 Maximum demand (tested): 44 kw.
 Energy consumed in 12 months: 69,900 kw-hr.
 Energy consumed average month: 5,825 kw-hr.
 Average monthly bill: \$105.57.
 Average rate earned: 1.86c per kw-hr.
 Output: Baker in charge states that the use of oven would be equal to the baking of about 90,000 lb. of breadstuff per month. Due to the variety of articles baked from day to day, he could not give a more accurate figure.

16—Classification: Bakery; bread and rolls and a small quantity of pastry.

Connected load: Oven only 40 kw.
 Maximum demand (tested): 46 kw.
 Energy consumed in 12 months: 66,260 kw-hr.
 Energy consumed average month: 5,522 kw-hr.
 Average monthly bill: \$89.72.
 Average rate earned: 1.63c per kw-hr.
 Output: Average 39,000 lb. breadstuff per month.

17—Classification: Bakery; general baking, including bread, rolls, cakes and cookies.

Connected load: Oven and mixer motor 32 kw.
 Maximum demand (metered): 30 kw.
 Energy consumed in 12 months: 41,940 kw-hr.
 Energy consumed average month: 3,495 kw-hr.
 Average monthly bill: \$99.67.
 Average rate earned: 2.85c per kw-hr.
 Output: Average monthly output as follows: 40,000 lb. bread, 5,200 doz. cookies, 4,000 doz. rolls and cakes.

Note: The majority of bakers called upon do not keep an accurate record of their daily output, but we have tried to arrive at a fair figure by discussing it with them and by comparison with other bakeries.

Conclusions

This committee is of the opinion that with the exception of steel furnace and bake oven loads, the industrial heating field in the Northwest has not even been scratched. In answer to the statement that industrial electric heating does not become available until diversified manufacturing develops on a larger scale than at present in our sparsely settled states, we direct attention to the fact that this statement is true only for large scale industrial heating. There are a multitude of small applications in small industries if we but look for them. These small applications bring a higher net revenue than the big furnace loads, which are invariably low rate stuff—1 cent per kw-hr. and under.

Pressing Machine Boilers

In connection with the development of small applications of electric heating along new lines, one company reports having done considerable work in connection with developing electric steam boilers for pressing machines.

The following tabulation gives a summary of one typical installation of this kind:

Classification: Electric steam boilers for clothes pressing.
 Connected load: 1 phase, 4 to 6 kw.
 Maximum demand (measured): 4 to 6 kw.
 Suits pressed per month: 350 to 450.
 Energy used per month: 1,000 to 1,500 kw-hr.
 Net rate earned: 1.75c to 1.90c per kw-hr.

Three of these boilers have been in operation for about a year and have given very satisfactory service. These boilers are built either in vertical or horizontal types, the units being installed horizontally in either case. They are the hairpin type immersion unit. Fig. 1 shows examples of both the vertical and horizontal installation—one photograph showing the equipment before lagging. It will be noted that the equipment

is made up entirely of standard pipe fittings. The boilers are equipped with a glass water gage, a safety pop-valve, and a steam gage and are thoroughly insulated with either 2 in. of 85 per cent magnesia or 2 in. sponge felt, with a protective canvas covering on the outside. They are built with a capacity of from three to four gallons of water with water level at the midpoint of the gage glass. They have a total capacity of approximately 6½ gal. of water, thus allowing from 2 to 3½ gal. for steam storage.

The particular company reporting handles the building of the boilers in its steam heating department, making the boilers out of either 8 in. or larger pipe.

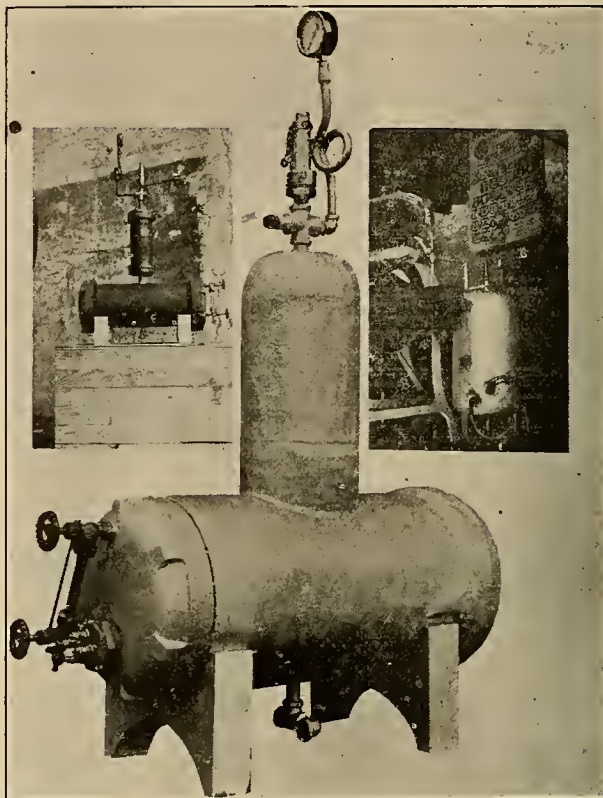


Fig. 1. Views of electric steam boilers for clothes-pressing service.

The horizontal boiler is sold at approximately \$75 and the vertical boiler at \$100. These boilers will operate Hoffman pressing machines very satisfactorily at a cost of from \$15 to \$25 per month for electric energy.

The particular company reporting the development of these boilers believes that on its system there will be a demand for approximately 100 installations of this type.

Financing Equipment

As to the question of securing business by financing the purchase of equipment for the prospective customer, the committee is not of one mind, the majority holding that central stations are not in the money lending business and that they are simply setting up the manufacturer's agent in business, and incurring unnecessary financial risks for themselves by so doing. As a method of pioneering a given field in virgin territory, however, it produces results. An outstanding example is that of the Northwestern Electric Company of Portland, which has taken on in excess of 700 kw. of new large baking load in the past year and a half by financing customer equipment. They contend they could not otherwise have added this load to their lines.

Pushed to its logical conclusion, there is no limit to which the financing of customer equipment might be carried, and most central stations are already carrying more deferred accounts than they desire without launching on a program that would materially add to the burden. The subject is one that will bear investigation from all of us.

Transportation Committee Report*

From such study as the committee has made of the electric truck situation, the field to which electric trucks may be applicable seems somewhat limited. Apparently the only field to which these trucks seem adapted, is the short-haul, frequent-stop delivery route. Since this is practically the only field in which horse-drawn vehicles still are in use, and in which they could compete, practically all effort and publicity put out in connection with electric trucks seems to be directed toward the replacement of horse-drawn equipment. Where the trips are longer and stops less frequent the work is pretty generally handled by gas vehicles since electric trucks do not seem adapted to this class of work. Hence it will be seen that the field to which electric trucks are adapted in northwest territory is comparatively limited. Also the extent of horse-drawn equipment in that territory is considerably less than in eastern centers. These factors likely account for the small use of electric trucks and also account for the resistance to the further extension of their use.

A survey of the electric-truck situation has been made in northwest territory, and the following gives its present status:

Washington—In Seattle there has been a little more activity on the part of battery and electric-truck people during the past year to stimulate the use and operation of electric trucks. There are in use in Seattle six electric trucks, operated by a laundry, two bakeries and the central station.

In Spokane there has been no special activity, due largely to the fact that no electric truck salesmen are active. There are, however, in operation in Spokane ten electric trucks, seven operated by laundries, two by a bakery, and one by a transfer company.

Oregon—In Portland one truck agency is very active and now is taking steps to arrange for charging stations in several of the prominent downtown garages. This should prove a considerable impetus to the sale of this type of truck since the elimination of charging equipment on the part of a purchaser will materially reduce his investment.

A prominent dairy has just placed in operation two 2-ton electric trucks. Several dairies, bakeries, laundries, transfer companies, and ice cream companies are giving this matter considerable study at this time and will watch the operation of these two new trucks with considerable interest.

There are in operation in Portland, in addition to the above-mentioned trucks, 25 electric trucks, 13 operated by bakeries, 9 by the American Express Company, and 3 by department stores.

Outside of Portland, so far as could be learned, no electric trucks are in operation.

Idaho—No activity during the past year and no electric trucks reported operating.

Montana—Little activity during the year. In Missoula the central station is operating two electric trucks which are giving entire satisfaction. They are particularly impressed with their long life, small upkeep and dependability.

Utah—In Salt Lake City a survey now is being made of all short-haul, frequent-stop routes and especially of all deliveries by horse-drawn equipment, towards the end of handling some of this business by electric trucks. No trucks now are in operation in the state.

One of the main drawbacks to the introduction of electric trucks seems to be in servicing. Especially the provision of charging equipment and also in follow-up work after a sale is made to see that the trucks are used on service for which they are adapted and in which they will show a saving, thus preventing the user from becoming dissatisfied.

It seems to be the consensus of opinion that this work should be aggressively handled by the truck sales agency. The truck agency also should be prepared to finance the sale of this equipment at least to a certain extent.

It has been contended that the central station should be the pioneer user of electric trucks and should use them wherever possible. In this particular territory, where a company must make the greatest possible use of all its motive equipment, electric trucks cannot be purchased and put into use indiscriminately. However, it is suggested that each company make this a real problem and determine where electric trucks can be used to advantage in operations. If such company uses no electric trucks it builds up sales resistance in connection with other prospects.

From the work of your committee this year it would appear that greater progress is being made in Portland than in the balance of the territory. This is likely due to a more aggressive campaign on the part of truck agencies there, but also due to the fact that the central station in Portland has made a rather extended study of the electric-truck problem, has sent men to the various truck schools on the coast, and seems entirely sold on its possibilities at least for certain classes of work. In some other sections apparently little study or attention has been given this problem with the result that no one in the organization has a very definite idea of the possibilities of this particular class of load builder, or aggressively follows this line of endeavor.

It is believed that this field has not been developed in this territory, nearly to the extent to which it can be developed. One way in which it can be further extended is for each company to take a real interest in this situation and to assign this work definitely to some member of the sales organization who will make it his job to study thoroughly and constantly follow this problem.

There is one field which seems to hold possibilities and in connection with which little has been said. This is the use of small electric storage-battery trucks for inside work in industrial plants and for haulage in connection with railroad depot work. There are certain installations where such trucks can be used to very good advantage and it would seem, due to elimination of noise and gas fumes, would have little competition.

* R. H. Ashworth, Utah Power & Light Company, chairman. California Oregon Power Company: R. S. Daniels. Helena Light & Railway Company: A. T. Schultz. Idaho Power Company: J. B. McLain. Pacific Power & Light Company: R. J. Davidson. Portland Electric Power Company: J. D. Scott. Puget Sound Power & Light Company: R. W. Clark. The Washington Water Power Company: E. E. Scofield.

Public Relations Section Reports

Executive Committee Report*

The personnel of the active committees functioning under the Public Relations Section were all selected at the beginning of the association year, which enabled such committees to formulate their programs and start to function without delay.

The first meeting of the executive committee was held in Portland, Ore., on Dec. 4, 1925, and was attended by the following members:

W. W. Briggs, Crays Harbor Railway & Light Company, Aberdeen, Wash. Z. E. Merrill, Mountain States Power Company, Albany, Ore. (representing C. M. Brewer.) W. J. Dennis, Northwestern Electric Company, Portland, Ore. P. M. Parry, Utah Power & Light Company, Salt Lake City, Utah. (Representing D. C. Green.) A. C. McMicken, Portland Electric Power Company, Portland, Ore. Geo. L. Myers, Pacific Power & Light Company, Portland, Ore. W. H. Ude, The Washington Water Power Company, Spokane, Wash.

The following committee chairmen and officers also were in attendance:

L. A. Lewis, president; W. F. Miller, secretary; Mrs. L. A. McArthur, chairman, women's committee; H. G. Winsor, chairman, industrial relations committee; Dwight Ware, chairman, customer-ownership committee, and J. B. Fiske, chairman, public speaking committee.

At the request of the chairman, President Lewis made a brief report covering his recent trip to Chicago where he attended a meeting of the Public Relations National Section.

The financial report, which was read by the chairman, revealed that \$2,570.67 had been expended out of the Section's appropriation of \$4,000, leaving a balance of \$1,429.33.

Women's Committee

Chairman Mrs. L. A. McArthur of the women's committee made a very interesting report outlining the activities of her work, stating that she had been successful in organizing a total of fourteen groups of women in the various member companies of the association. Mrs. McArthur's committee held its initial meeting in Salt Lake City during the month of October. It proved to be a very successful meeting, and was followed with another meeting in Seattle in February.

Customer-Ownership Committee

Dwight Ware, chairman of the customer-ownership committee, reported that his committee has not as yet held a meeting during the current administrative year, but contemplated doing so in the near future. All were impressed with the importance of vigorously pursuing customer-ownership activities, and the committee charged with the responsibility of handling the work will do its part in making a satisfactory showing this year. The question of member companies exchanging their securities and good-will advertising was discussed, and it was the consensus of opinion of the meeting that this practice should be continued, with the understanding that member companies should send to Chairman Ware a sufficient number of copies of their various advertisements in order that he in turn might make proper distribution of them to the members of his committee.

Public Speaking Committee

J. B. Fiske of the public speaking committee outlined the program he had arranged for the members of his committee this year, and while he has not been very successful in securing copies of the various

addresses made by officers and representatives of member companies, he was assured by those present of full co-operation in the future. There are indications that members of the committee will make as many talks this year as were made in previous years. Public speaking was thoroughly discussed by all present with the result that the chairman of the committee heading this activity received numerous valuable suggestions.

Industrial Relations Committee

H. G. Winsor, chairman of the industrial relations committee, reported that he had just completed the personnel of his committee, and that a meeting of the committee would be held in the near future. It is the plan of his committee to study the following program:

1. Employment.
2. Compensation.
3. Training and Education.
4. Thrift Plans.
5. Medical Attention and Health.

It was the consensus of opinion that the industrial relations committee should go into its proposed program very thoroughly and ascertain from member companies to what extent the program has already been adopted, and furnish them with such information as it is able to gather in connection with the various phases of the program in order that they might consider their adoption.

Educational Institutions

Section Chairman W. H. Ude reported on the activities of the committee on co-operation with educational institutions in the absence of Chairman A. J. Priest. He stated that at a recent meeting held with faculty members of the University of Idaho and the Washington State College, arrangements had been completed to provide speakers to discuss before student assemblies and classes of students the more important subjects relating to the light and power industry. When the program at these two institutions is under way the committee will also make an effort to make similar arrangements with other higher educational institutions located in other cities throughout the Northwest geographic division.

The subject of radio interference was briefly discussed, and according to members of the executive committee practically all of the larger member companies have employed both full time and part time radio experts to assist in eliminating radio interference. The importance of the light and power industry co-operating with radio fans and radio dealers in order that improved radio reception may be realized is fully appreciated, particularly from a public relations angle.

Second Meeting

The second meeting of the executive committee was held in Seattle, Wash., on Mar. 12, 1926.

Roll call of the committee revealed the following members present:

W. H. Ude, chairman, The Washington Water Power Company, Spokane, Wash. N. W. Brockett, Puget Sound Power & Light Company, Seattle, Wash. G. L. Myers, Pacific Power & Light Company, Portland, Ore. C. M. Brewer, Mountain States Power Company, Albany, Ore.

The following committee chairmen and officers also were in attendance:

R. B. King, vice-president for Idaho; L. A. McArthur, chairman, women's committee (representing Mrs. L. A. McArthur); H. G. Winsor, chairman, industrial relations committee; J. B. Fiske, chairman, public speaking committee, and Dwight Ware, chairman, customer-ownership committee.

Considerable time was given to the discussion of a proper program for the Public Relations Section at the

*W. H. Ude, The Washington Water Power Company, chairman. N. W. Brockett, Puget Sound Power & Light Company, vice-chairman. The California Oregon Power Company: P. B. McKee. Eastern Oregon Light & Power Company: J. P. Lott-ridge. Grays Harbor Railway, Light & Power Company: W. W. Briggs. Idaho Power Company: A. J. Priest. Mountain States Power Company: C. M. Brewer. Northwestern Electric Company: W. J. Dennis. Pacific Power & Light Company: G. L. Myers. Portland Electric Power Company: A. C. McMicken. Utah Power & Light Company: D. C. Green.

forthcoming convention of the Northwest Electric Light and Power Association, scheduled to take place in Spokane, June 14-17, 1926.

It was the consensus of opinion that a debate on "Service" be staged by Charles A. Stuart, assistant to the vice-president and general manager of the Northern States Power Company, Minneapolis, Minn., and Norwood W. Brockett, director of public relations, Puget Sound Power & Light Company, Seattle, Wash. The question to be decided is to ascertain if a public utility company can secure and hold good-will on the basis of courtesy and service only, or if other activities such as: good-will advertising, public speaking, etc., are essential. The chairman was requested to have President L. A. Lewis, extend to Mr. Stuart an invitation to attend our convention for the purpose of debating the affirmative side of the subject mentioned. Mr. Brockett is to work out all details in connection with this debate.

In addition to this proposed debate it was the consensus of opinion that the subject of the relation of electricity to agriculture be given an important part on the public relations program, and that Dr. E. O. Holland, president of the State College of Washington, be invited by President Lewis to make the principal address. It was also recommended that Dr. A. H. Upham, president of the University of Idaho, at Moscow, Idaho, and Dr. James T. Jardine, director of the Oregon Experimental Station, Corvallis, Ore., be invited to participate to the extent of making a fifteen or twenty minute address. It was also thought advisable to invite Dr. E. A. White, director of the national committee on the relation of electricity to agriculture, Chicago, Ill., to present a short report covering the accomplishment of his committee during the past year.

Inasmuch as that suggested program undoubtedly would take up most of the afternoon, it was the opinion of the executive committee of the Public Relations Section, that the women's committee ought to be given an entire afternoon for its program, and the chairman was requested to arrange such through President Lewis.

All concerned were agreed that it would be unwise to devote any time to the discussion of committee reports because all such reports would be available to members of the association in proceedings form.

L. A. McArthur favored the committee members with a very thorough outline of the municipal ownership measures which have been initiated in the state of Oregon.

The question of radio interference was also discussed at some length, and the importance of member companies co-operating with radio listeners for the purpose of eliminating interference was emphasized.

Rural Electrification

The state advisory committees covering, Idaho, Washington and Oregon, each are making satisfactory progress in connection with their studies on the relation of electricity to agriculture, and will render their reports at the forthcoming annual convention of the association taking place in Spokane, June 14-17, 1926.

Educational Institutions

Under the able leadership of Chairman A. J. Priest, the committee on co-operation with educational institutions has accomplished some very excellent results. It has secured closer co-operation between in-

stitutions located in the Northwest geographic division. A splendid foundation for future work has been laid by this committee, and it is hoped that future administrations of the association will continue to do similar work.

Committee on Customer-Ownership

Regardless of the fact that only one general meeting of the customer-ownership committee has been held during the current year, the work under the able leadership of Dwight Ware, chairman of the committee, has been carried on in an energetic and effective way. Member companies of the Northwest geographic division thoroughly appreciate the importance of vigorously prosecuting their customer-ownership program.

Committee on Public Speaking

Under the very able leadership of Chairman J. B. Fiske, the committee on public speaking accomplished much good for the light and power industry during the current administrative year. While no meetings of the committee were held, the work was nevertheless vigorously prosecuted by correspondence. The report of this committee is interesting and instructive and should be carefully studied by every member of the association.

The second annual report of the women's committee of the Northwest geographic division will reveal the progress made by that committee under the able leadership of Mrs. L. A. McArthur, wife of the vice-president and general manager of the Pacific Power & Light Company, Portland, Ore., who very graciously accepted the important assignment of chairman. The splendid results that are being secured by the women of our industry throughout the Pacific Northwest are conspicuous, which this executive committee feels sure compares very favorably with similar work being done in other geographic divisions of the N.E.L.A. throughout the nation.

This branch of the association's work should be carried forward in the future in the same aggressive manner as that of the past year, and if so continued the results will be reflected in a very much better public understanding of the many problems concerning the light and power industry throughout the country.

Reports of Committees on Public Relations for Washington, Idaho, Oregon, Utah and Montana

The vice-presidents selected to look after the public relations work of the various states located in the Northwest geographic division have done a good work for the light and power industry, as their published reports in the proceedings of the forthcoming annual convention will reveal.

General Remarks

The executive committee of the Public Relations Section acknowledges with gratitude the co-operation and assistance rendered it by President Lewis A. Lewis and representatives of member companies who served so faithfully and well on its committees throughout the past year.

It is hoped and strongly recommended that the various activities of the Public Relations Section be carried forward aggressively the coming year.

Women's Committee Report*

The women's committee of the Northwest Electric Light and Power Association, although so new, is

significant for the timeliness of its inauguration. The chairman has met with warm and intelligent interest and found a willingness to work on the part of the women. There has been also an invigorating desire to start this work off under the most favorable auspices on the part of company executives and officials.

There are a number of small Class "A" companies in the Northwest association which are represented through the larger companies controlling them. All except two of these larger companies have organized women's committees and of one of these the company has appointed a chairman. Most of the smaller Class

* Mrs. L. A. McArthur, Pacific Power & Light Company, chairman. Eastern Oregon Light & Power Company: Anna Gyllenberg. General Electric Company: Clara Redheffer. Grays Harbor Railway, Light & Power Company: Esther Miller. Idaho Power Company: Mrs. N. J. Johns. Molalla Electric Company: Mrs. E. G. Robinson. Mountain States Power Company: Stella Dorgan. Northwestern Electric Company: Mrs. A. W. Angell. Oregon Public Utility Information Bureau: Edna Comstock. Pacific Power & Light Company: Ellen McCurdy. Gertrude Humphreys. Portland Electric Power Company: Marguerite Butler. Puget Sound Power & Light Company: Nelle Duffey. Bertie Neil. Utah Power & Light Company: Mrs. A. E. Moyle. The Washington Water Power Company: Mary K. Walsh.

"A" companies have few women employees. As this work goes on it is hoped that succeeding chairmen will interest these companies through the wives of employees, who may thus form committees of their own.

There are five large supply companies in the association, of which the General Electric Company in Portland has a women's organization, these including the Pacific States Electric Company, and Fobes Supply Company, jobbing companies, and the Stubbs Electric Company, a retail company. It is understood that several of the committee's central station chairmen have included the supply companies of their territory in their work, but owing to recent circumstances the committee has been unable to obtain data on this matter in time for this report.

The unique work of this committee, and this is the only one in the United States to have undertaken it formally, lies in the inclusion of the wives and families of company employees, in many cases, as integral parts of the women's work. The chairman feels that there is a great future in this

field. Sufficient attention has not been paid in the past to the voting power of the seemingly negligible women.

The recommendation of the chairman for the future direction of this work by the Public Relations Section is that the Section emphasize the intimate nature of the work, seeking development of friendly personal relations between the women's committee and the men of its companies, and the public with whom the women come in touch. Group contacts, scattering contacts, such as those represented by public speaking, for instance, are, in the chairman's opinion, of no particular value without personal friendliness and individual follow-up work. Some contact with the people spoken to seems essential on the part of the speaker herself.

In conclusion, the chairman cannot speak too highly of the men and women with whom this work has brought her in contact. They stand high in her regard. She leaves the women's committee at the expiration of her term with regret and warmest congratulations to her successor upon the inspiring opportunities awaiting her.

Co-operation with Educational Institutions Committee Report*

This committee held its first meeting in Pullman, Wash., Oct. 16, 1925. Deans, heads of departments and other members of the faculties of Washington State College and the University of Idaho met with the committee. After detailed discussion of the form which our co-operation should take, it was decided to arrange a series of talks upon public utility subjects to be delivered to students in both institutions by officials of N.E.L.A. member companies in the Pacific Northwest. Tentative listings of both speakers and their subjects were prepared and submitted to the faculty members interested.

L. A. McArthur, vice-president and general manager of the Pacific Power & Light Company, delivered the first of this series of talks Dec. 16-17. Mr. McArthur addressed large student groups both at the University of Idaho and at Washington State College on the subject, "General Economics of the Public Utility Business." His discussions of this important phase of the public utility problem were favorably received and our faculty friends reported cordial interest on the part of the undergraduates themselves.

The committee chairman was given the second place upon the program. He discussed certain phases of public utility regulation, both at Pullman and at Moscow, meeting a large group of Washington State College engineering and economic students on Mar. 11. He talked to the groups, one of students in business administration and the other of engineering students and prospective lawyers, at the University of Idaho the following day. Questions asked disclosed that the students have an intelligent grasp of the elements of public utility regulation.

* A. J. Priest, Idaho Power Company, chairman. *Journal of Electricity*: B. H. Snow. Oregon Public Utility Information Bureau: W. P. Strandborg. Pacific Power & Light Company: R. B. Bragg. Puget Sound Power & Light Company: L. B. Faulkner, R. W. Lindley. Utah Power & Light Company: R. H. Ashworth. The Washington Water Power Company: J. B. Fiskien.

Arrangements are being made for the delivery of addresses by M. W. Birkett, of The Washington Water Power Company, and by President L. A. Lewis, of the Northwest Electric Light and Power Association, at some time in the very near future. J. B. Fiskien's talk on the "History of Electric Service" has also been asked for, both at Pullman and at Moscow, and will be delivered before the close of the present college year. There seems to be every likelihood that at least five addresses on public utility problems will be delivered at these two institutions by officials of our member companies before college commencement time.

The committee feels that relations with the University of Idaho and Washington State College could hardly be more cordial. Faculty members have been more than friendly and there has not been the slightest difficulty about the arranging of college programs so that addresses on public utility matters could be presented at convenient times. It is hoped that it may be possible to arrange a committee meeting at one of the Oregon schools later this spring for the purpose of bringing about the same happy understanding with the University of Oregon, Oregon Agricultural College and the University of Washington which has been arrived at in the case of Washington State College and the University of Idaho.

The chairman's own feeling is that the industry has nothing to fear from the incipient "parlor socialism" in any of our Northwest institutions of higher education. There seems to be genuine interest in hearing the utility story and, although it is certain that faculty members would not look with favor upon propaganda, so long as the speakers confine themselves (as of course they will) to statements of fact and to unbiased presentations of economic, legal and engineering theories, there is every reason to believe that our speakers will be warmly welcomed and that their message will reach the undergraduate body under decidedly favorable conditions.

Customer-Ownership Committee Report*

One general meeting of the customer-ownership committee has been held during the current year. It was the consensus of opinion of the members of the committee that the sale of stock to the public and to employees has been a success and should be continued wherever possible. All members reported an improvement in their contact with, and a better feeling to-

wards the company on the part of the public, as well as an improvement in the esprit de corps of the employees who have become stockholders.

Companies actually engaged in the sale of stock to their customers during the present year report a very healthy demand for their securities, and in most cases the demand exceeded that of last year.

While it is natural that the number of employees owning stock should fluctuate, an estimate showed that an average of 50 per cent of the employees of companies represented were stockholders, and one company reported as high as 75 per cent of its employees stockholders.

* Dwight Ware, Puget Sound Power & Light Company, chairman. The Montana Power Company: F. M. Kerr. Mountain States Power Company: F. E. McKenna. Pacific Power & Light Company: S. E. Skelley. Portland Electric Power Company: H. C. Schade. The Washington Water Power Company: B. H. Bishop.

Instances in which a company has temporarily stopped the sale of stock to its customers show a tendency for an increase in the average number of shares held by stockholders.

While some of the companies who previously sold stock in their localities are not active at present, this is not an indication that the companies have given up the customer-ownership idea, but merely that they

are not in need of funds from this source, or that their financial structures were such as not to lend themselves easily to the customer-ownership program.

Indications are that 1926 will be an active year for the customer-ownership committee members of the Northwest Electric Light and Power Association.

No important suggestions or radical changes in the method of selling stock to the public have been made.

Public Speaking Committee Report *

During the past year the chairman, on account of the wide distribution of the members of this committee geographically, did not consider it either necessary or advisable to hold any meetings of the committee, and all the work done has been done by correspondence.

Throughout the year this committee, through the chairman, has endeavored to co-operate with the national public speaking committee of which W. S. Vivian was chairman.

On Nov. 12, 1925, a copy of an organization plan which had been submitted for approval to the executive committee, Public Relations National Section, by the national speaking committee, and which had been approved, was sent to each member of this committee. This plan contemplated the following organization:

- A. A national committee on public speaking.
 - B. Geographic division committees in public speaking.
 - C. State committees on public speaking.
 - D. District committees on public speaking.
- In transmitting this organization plan to the members of this committee the chairman stated:

"I have notified W. S. Vivian, chairman of the national public speaking committee, that our association has no district nor state organization. I do not think it advisable to attempt such organizations at the present time but think it would be preferable to wait until the present divisional committee has become more active. I would be glad to learn your ideas on this subject."

As no adverse criticism was received this retiring committee makes the recommendation that the next committee to be appointed give this organization plan some consideration.

In the same letter of transmittal the chairman stated: "Please let me have your opinion regarding the program generally."

A Worthwhile Criticism

One member of the committee criticised this program as follows:

"I believe that educational talks before high school pupils regarding the electric light and power industry, its methods of billing and the economics involved, would be very helpful, but I am strongly of the opinion that in any such talks regarding the industry the service rendered by it should be emphasized and this should be followed by some comparative statistics showing the smallness of the industry, when it is measured in dollars and cents. The gross receipts per annum of the moving picture theatres are in excess of three and one-half times the residential lighting bills and in excess of the total gross receipts for residential, commercial and street lighting, power, etc. If we compared the total power receipts and the residential lighting receipts with such classes of business as wholesale groceries, wholesale dry goods, gasoline and automobile sales, we would be able to show that the bigness of the electric light and power industry can only be measured by the service its renders, and that as a matter of fact, if we use the dollar mark as yardstick, we are only running a peanut stand.

"I will frankly admit that I am apparently out of line with the generally accepted ideas on publicity matters held by utility executives. It seems to me

that the accepted program is that we should appear without invitation before every civic organization, or in fact every audience where we can get our foot in the door, and make a speech telling them how big the industry is. I firmly believe that the wave of municipal ownership agitation which seems to be again approaching has been prompted partly by this educational plan of telling people how big the industry is. The utility executives naturally, get the idea that the electric light and power industry is the biggest thing in the world, and the layman always uses the dollar mark as his yardstick. It is not surprising, therefore, that when the municipal ownership idea is suggested to him, he immediately deducts from the speeches regarding the electric light and power industry that if the city owned its light plant, the millions of money that it would make would pay all taxes.

"I personally believe that when we are requested to talk regarding our industry we should emphasize the small part of the family budget that is represented by the gross earnings of our business. The power business is purely competitive, and our comparisons should be made on the residential lighting bills."

This communication was submitted to the other members of the committee for their criticisms and was discussed at a meeting of the executive committee of the Public Relations Section. To some extent, though not entirely, the ideas above quoted were endorsed. This is a question which should be given serious consideration by the committee next year.

Early in the year the attention of the members of the committee was called to the speaker's hand book which had been issued by the national committee on public speaking, but very little use has been made of this publication.

Few copies of talks given during the year have been furnished the chairman, but all such talks have been duplicated and copies have been furnished to the members of the committee.

The following statement covers the talks reported by the different members of the committee as being given:

Summary of the Work

Lewis A. McArthur for the Pacific Power and Light Company's territory:

Speakers	
Lewis A. McArthur.....	3
Geo. C. Sawyer.....	3
S. E. Skelley.....	15
H. H. Schoolfield.....	1
District managers.....	5
	27
Attendance	
Audiences in Idaho.....	350
Audiences in Washington.....	2,150
Audiences in Oregon.....	1,400
Audiences not detailed.....	250
Total	4,150
Character of Audiences	
Students.....	
Chamber of commerce.....	
Luncheon clubs.....	
Subjects not reported.....	

A. J. Priest for the Idaho Power Company's territory:

No talks have been given by anyone connected with this company. At present skeleton talks covering public utility problems generally, and their own operations specifically are being prepared which can be given before luncheon clubs and similar organizations.

Captain Norwood W. Brockett for the Puget Sound Power & Light Company territory:

* J. B. Fisk, The Washington Water Power Company, chairman. Alaska Electric Light & Power Company: W. S. Pullen. The California Oregon Power Company: P. B. McKee. Eastern Oregon Light & Power Company: A. A. Smith. Helena Light & Railway Company: A. T. Schultz. Idaho Power Company: A. J. Priest. Pacific Power & Light Company: L. A. McArthur. Puget Sound Power & Light Company: N. W. Brockett. Utah Power & Light Company: R. E. Bailey.

July 20, 1925. Captain Brockett. Before the Pacific Coast Advertising Clubs Association Convention. "Public Utility Good-Will Advertising." Attendance 25.

Aug. 21, 1925. Before the Pacific Coast Gas Association Convention. "Tell the People." Attendance 200.

Dec. 7, 1925. Before the midwinter meeting of the Chamber of Commerce of the United States. "Hydroelectric Development." Attendance 300.

June 3, 1925. G. H. Peets. Before the Broadway high school, Seattle. (Subject not given.) Attendance 65.

Dec. 18, 1925. Before a gathering at Oak Harbor. (Subject not given.) Attendance 300.

Mrs. Lemon. (Subjects not given.) Before the following audiences:

Oct. 5, 1926. Horticultural Society of Rainier Valaley, Seattle. Attendance 23.

Jan. 19, 1926. Seattle Business and Professional Club.

Various dates. Social clubs in Seattle (2). Improvement clubs, Seattle (5). Commercial clubs, Seattle (4). Community clubs, Seattle (5). Women's clubs, Seattle (73).

All of the above talks were given in the state of Washington. Captain Brockett also reports a large number of talks having been given by him and by others connected with him prior to the beginning of the association year, but these are not included in the above statement.

A. A. Smith for the Eastern Oregon Light & Power Company's territory:

Dates not given. By A. A. Smith... Before the Baker Chamber of Commerce. Attendance 35. Kiwanis Club at Baker. Attendance 50. Total all in Oregon 85. "Public Utility Problems in Connection with Proposed Water Power Bill."

A. T. Schultz for Montana:

Reports that no talks have been given by members of this company (The Helena Light & Railway Company) nor by any others at his request.

D. C. Green for the Utah Power & Light Company's territory:

Dates not given. By E. L. Bourne. The Kiwanis Club, Salt Lake City. "Super-power System of Utah Power & Light Company." Attendance 65.

Brigham City Commercial Club. "Cutler Development of Utah Power & Light Company." Attendance 200.

Intermountain Co-operative League: "Advertising for the Contractor-Dealer." Attendance 40.

Utah Society of Engineers, Salt Lake. "Engineering Advertising." Attendance 12.

Kiwanis Club, Salt Lake. "Street Cars, Motor Cars and Traffic." Attendance 60.

Contractor-Dealers' Association. "Selling Lighting and Wiring." Attendance 30.

Utah Power & Light Company employees, Salt Lake. "Selling Yourself and Your Company." Attendance 150.

Better Business Bureau, Salt Lake. "Truth in Advertising and Integrity in Selling." Attendance 30.

Kiwanis Club, Park City, Utah. "Super-Power System of Utah Power & Light Company." Attendance 30.

Advertising Club. "Selling Service." Attendance 52.

Dates not given. P. M. Parry. Municipal League, Mt. Pleasant, Utah. "Rate Making for Electric Service." Attendance 200.

Brigham City, Utah, Commercial Club. "The Electrical Industry." Attendance 200.

D. C. Green. "Electric Night" by radio, station KSL, Salt Lake City. "The Generation and Distribution of Power."

All of the above talks were given in Utah.

Paul B. McKee for the California Oregon Power Company's territory:

No report has been submitted by Mr. McKee but the following talks have been given in the district:

Dec. 1, 1925. John B. Fiske. Before the California Oregon Power Company Forum at Medford, Ore. "Accident Prevention and Resuscitation and Presentation of an Insull Medal." Attendance 150.

Dec. 2, 1925. Before employees' organization of Mountain States Power Company, at Albany, Ore. "Accident Prevention and Resuscitation." Attendance 80.

Dec. 3, 1925. Before the engineering faculty and students Oregon Agricultural College, Corvallis, Ore. "Accident Prevention and Resuscitation." Attendance 500.

All of the above talks were given in Oregon.

The only talk given in the territory of The Washington Water Power Company was given by Lewis A. Lewis, president of this association, on Sept. 8, 1925, before the Spokane teachers' institute at Spokane, Wash. His subject was "Your Electric Service Company" and the attendance was 200.

With one exception all the talks have been given by employees of member companies and without expense to the association. The one exception was the case of Mrs. Lemon who gave ninety-one talks to various organizations in Seattle.

This committee would urge that during the next year the member companies give some attention to the training of their employees in public speaking and avail themselves of every opportunity to tell the story of the electrical industry to the public.

State Vice-Presidents' Reports

Idaho*

Educational work, primarily among employees, has proceeded along the plans laid out in previous years, and pleasant relations, both among employees and with the public, have been maintained on an even balance, accomplished mainly by individual contact and fostered by assembly meetings from time to time, as well as by occasional distribution of timely topics in print and the progress has been marked by an almost complete absence of friction.

Employee relations are in sound condition, and a spirit of friendliness obtains, with wider feeling of mutual confidence.

Operating properties have been kept at a high standard of utility and appearance, and grounds surrounding the properties are maintained in cleanly and slightly condition. Visitors are made welcome to the grounds and, under escort, into the buildings. Various school classes have been visitors to their nearby electric stations in pursuit of their studies. Luncheon clubs, also, have been entertained in their visits to the stations.

Addresses and talks have been made by company executives and officials, from time to time, to various organizations, both business and social, and to institutions such as the Y.M.C.A. Members of the industry have continued to participate in public activities, through the fields of charity and uplift, ranging from the practicalities of material betterment to the higher ideals of mental improvement.

* Report of R. B. King, Idaho Power Company, vice-president for Idaho.

A women's public utility information committee has been organized and is functioning, but is not yet under good headway. Monthly meetings are held and the organization has been so perfected as to be quite ready to proceed further in its field. By the time another year rolls around it will have broadened its working field and widened its activities so that its accomplishments will have been marked.

Relations with the newspaper press continue along the lines of better understanding and present no features of remark.

The aim has been to establish good relations, more through the individual members of the industry in their associations with members of the public, rather than to carry on educational work "en masse." It has been the aim, also, to so order the ways and methods of doing business that the actions and deeds themselves will speak more loudly than words, and to accompany the actions, when and where feasible, with such verbal explanations as will tend to make the reasons open to common understanding.

Information to the employee of practical experience, of the whys and wherefores of this, that and the other subject, and the contact of the employee with members of the public, should be productive of a more effective means of education, at least among the directly interested members of the public, who use the service. And this has been our primary aim—to instruct and inform the employee so that he or she, in turn, can inform and advise the members of the public with whom contact is made. Applying as this does to the entire cross-section of the public, through the various classes of commerce, trade and profession

and applying continuously, together with addresses and talks continually being made by executives and officials to assemblies of many kinds, the results manifest have been quite gratifying.

Oregon*

The electrical power industry of Oregon seems certain to be confronted with the necessity for a campaign this year in opposition to proposed legislation for the production and distribution of electrical power by the state. Three initiative petitions have been filed with the secretary of state, two proposing amendments to the constitution and one proposing a bill. All initiative petitions must be filed not less than four months preceding the election at which they are to be voted upon, which would be in July, as the election is to take place in November. One of the proposed amendments has been filed by the Housewives' Council of Portland, and one by the Oregon State Grange and the bill is proposed by the Oregon State Grange, the Public Ownership League of Oregon and the Hydro-Electric League of Oregon.

"Housewives" Amendment

The outstanding provisions of the amendment proposed by the Housewives' Council provides for "The Oregon Water and Power Board," the original personnel of which is provided for therein for specified terms, upon the termination of which each member is to be elected by popular vote for a term of six years. The board is vested with power to construct or acquire by purchase or condemnation property needed for the development and distribution of electrical power, to acquire or construct distribution systems for political subdivisions and to acquire any property or the joint use of it by condemnation.

The credit of the state may be pledged to the extent of five per cent of the assessed valuation. Bonds may be issued and sold to provide payments for principal and interest upon outstanding bonds whenever revenues are insufficient therefor, or moneys may be temporarily advanced from the general fund whenever moneys applicable to the payment of principal and interest, when due, are insufficient and such sums are to be collected each year in addition to other revenues required by the state. Such moneys are to be returned to the general fund whenever revenues of the board become available. The board is to fix rates for service which are to be sufficient to amortize the investment within 50 years and, in the case of the construction or acquisition of distribution systems for political subdivisions, rates must be fixed which in the board's judgment will repay the state for expenditures and interest within thirty years.

The proposed amendment filed by the Oregon State Grange enables the State to develop and distribute electrical power and to pledge its credit for such purpose.

The "Water Power" Bill

The principal provisions of the proposed bill filed jointly by the Oregon State Grange, the Public Ownership League of Oregon and the Hydro-Electric League of Oregon are as follows:

A water and power board is created to consist of five members, the state engineer to be ex-officio a member and the other four members to be appointed by the governor and the terms of office to be four years. The board's powers are similar to those provided for in the proposed amendment of the Housewives' Council and other provisions are similar with the following exceptions:

The members of the board are to be salaried officials and are to perform all of the duties performed by the state water superintendent and the state water board, previous to the transfer of such duties to the state engineer in control of the waters of the state and the determination of rights to their use. The credit of the state may be pledged to the extent of four per cent of the assessed valuation. The board is authorized to issue "interest bearing hydroelectric utility certificates" against any property constructed or acquired, which certificates may be paid solely from the revenues in the operation or sale of such prop-

erty. The board is to fix such rates as may be necessary to amortize the investment within thirty years.

All property owned or controlled by the state under the provisions of the proposed bill is to be taxed like other utility property. Provision for the sale of bonds and the appropriation of moneys from the general fund to make up deficiencies in revenue for the payment of principal and interest when due upon bonds outstanding are not a part of this proposed bill.

The amendment to the constitution proposed by the Oregon State Grange merely empowers the state to enact legislation so that it may produce and distribute electrical energy. Therefore, the proposed bill is to provide legislation, under authority of the proposed amendment to the constitution. The proposed bill would have only the effect of a legislative enactment and consequently is subject to amendment or repeal by the legislature or by the people under the initiative.

An organization to maintain an aggressive educational campaign against the adoption of the legislation proposed at the present time or any legislation which may be subsequently proposed is taking definite form at the time of the writing of this report.

Pole Line Permits

The committee had brought to its attention early in the association year the need of a standard form of permit for the location of pole lines along state highways. The committee, at a meeting in consideration of this subject, finally suggested to the State Highway Commission the advisability of a special committee, representative of the Highway Commission, the Public Service Commission, the telephone and telegraph utilities and the electrical power utilities, to make a study of the situation and submit recommendations to the Highway Commission, which suggestion was approved. A satisfactory meeting with representatives of the Highway Commission was held with the result that a standard form of application and permit was accepted. However, one point which may be productive source of trouble has not been settled. This is a provision for the designation of the location of poles and fixtures. The commission has designated a location 29 ft. from the center of the highway, which results in an overhang of crossarms on private property.

From the foregoing it will be observed that the committee has confined its activities to matters of legislation and relations with governmental administrative bodies, not having been active in other matters of public relations because specific committees of the Public Relations Section have been assigned to specific endeavors in the development and maintenance of satisfactory public relations.

Utah*

Perhaps it is known that the Utah Power & Light Company is in a rather peculiar situation in respect to matters of this kind, since it serves most of the state of Utah. There are two or three independent companies in the state, but these are very small and serve unimportant and sparsely settled communities, and are consequently without funds for work of this kind. Under these conditions it would be evident to everybody in the state that so far as the light and power industry is concerned a committee on public utility information would actually be a committee of the Utah Power & Light Company, and any information put out by such a committee would be merely regarded as propaganda.

Consequently we have felt it desirable to do whatever publicity work has been done along this line frankly for and over the name of the Utah Power & Light Company. This is being done in the way of display advertising in urban and rural newspapers, local magazines and yearbooks or special publications of schools, civic societies, business associations, lodges or other aggregations of the public which it is believed desirable to reach with institutional messages to cultivate good will. Outdoor displays have also been used and frequent use is made of printed matter

* Report of G. L. Myers, Pacific Power & Light Company, vice-president for Oregon.

* Report of D. C. Green, Utah Power & Light Company, vice-president for Utah.

inserted in customers' monthly bills. That the public desires to be informed in regard to public utility problems and policies would seem to be indicated by the frequent requests which come to us from clubs and other organizations for members of our organization to appear before them and address them.

Rocky Mountain Electrical Co-operative League

Aside from the publicity work conducted by the Utah Power & Light Company, there is also some good work of this kind being done by the Rocky Mountain Electrical Co-operative League, which is an organization supported by the various branches of the electrical industry in and about Salt Lake City, such as manufacturers, jobbers, contractor-dealers, and the Utah Power & Light Company. The present activities of this league, however, are limited to Salt Lake City and do not in any way cover the state of Utah.

The Utah Power & Light Company publishes a house organ which is distributed to its employees, in which it is endeavored to stress the importance of cultivating the good will of the public.

Frequent meetings of employees are held in the various divisions of the territory, wherein interesting discussions of company problems take place. In all of these meetings the subject of relationship with the public is emphasized. Relations with the public are on the whole satisfactory, and we have every reason to believe that this favorable condition will continue.

Washington*

The duty of investigating proposed legislation affecting the industry is also imposed upon this section.

At the recent special session of the legislature, many bills were introduced seriously affecting our business.

Roughly, they can be divided into two classes:

- (1) Those which were introduced for the deliberate purpose of harassing and crippling the industry, and
- (2) those introduced in good faith, the authors of which have not made sufficient investigation of the problems involved to fully realize their effect.

The first class of legislation gave very little trouble. The average member of the legislature is sincere and honest in his desire to secure legislation which will

*Report of N. W. Brockett, Puget Sound Power & Light Company, vice-president for Washington.

benefit any legitimate business and when the malice behind the particular measure can be shown, he almost invariably resents the attempted use of legislative power to accomplish a malicious object.

The second class of legislation requires more work, in that it is necessary to convince the members of the legislature that such measures will not only cripple the industry but will be an actual detriment to the people of the state.

This can only be done by explaining these measures to the legislative committees to which they have been referred, and by also explaining them to the different members of the legislature. The committees are generally limited to six or eight members, while there are ninety-seven members in the House and forty-four in the Senate, each of whom will vote upon the measure.

In every case, we were invited to appear before the committee to explain just what the effect of these measures would be and our representatives were treated with uniform courtesy and consideration. We also found that the average member of the legislature was glad to have us talk to him on such measures, as he was seeking information which would enable him to vote intelligently.

The most serious measure was the Jacobs bill which followed the general principles of the Bone bill and permitted cities to sell electric energy outside their city limits. Its author, Mr. Jacobs, had written all the members of the legislature, before the session convened, that this was a "compromise bill," leaving the inference that the industry had acceded to the compromise. Through this means he obtained the pledges of many members who did not know that the measure was in reality the Bone bill, which had been repudiated by the people. Open meetings were held by the House committee to which this measure was referred and all but two members of this committee reported adversely upon the measure.

The majority of the members of the legislature were also convinced that this bill was not for the best interests of the people of the state, and it failed its passage.

An enumeration of all the measures which were introduced affecting the industry would be tedious, but the section is pleased to report that the members of the legislature refused to pass any measures aimed to cripple the industry or to prevent its legitimate expansion throughout the state.

Technical Section Reports

Executive Committee Report*

Five meetings of this committee have been held during the past year. One of these was a luncheon meeting held at the time of the third general meeting of the Technical Section at Seattle, and one was an adjournment of this meeting. The remaining three meetings were as follows:

Portland, Sept. 4, 1925.

Seattle, Nov. 3-4, 1925.

Spokane, Jan. 6-7, 1926.

Average attendance at all five meetings was 74 per cent. Five members of the committee attended all five meetings, four attended four meetings, three attended two meetings and one attended one meeting. Everything considered, this can be termed a very good record, establishing the importance of and the interest displayed in the work of this committee.

Committees

The following committees were appointed and the chairmen requested to study as far as possible matters of particular interest to the industry in the Northwest:

Accident Prevention, John B. Fiskien, chairman.
Electrical Apparatus, D. W. Proebstel, chairman.
Inductive Co-ordination, G. E. Quinan, chairman.
Hydraulic Power, O. L. LeFever, chairman.
Meters, R. E. Thatcher, chairman.
Overhead Systems, J. B. Brokaw, chairman.
Co-operation with Regulatory Bodies, H. J. Flagg, chairman.
Prime Movers, C. C. Simeral, chairman.
Underground Systems, E. F. Pearson, chairman.

The work of these committees is covered by separate reports submitted herewith.

National Group Meetings

The association was represented at both group meetings of the Technical National Section as follows:

Detroit group meetings, Oct. 6-9, 1925, Z. E. Merrill, O. L. LeFever and M. T. Crawford.

Kansas City group meetings, Feb. 9-12, 1926, John B. Fiskien, R. R. Robley and E. F. Pearson.

*Z. E. Merrill, Mountain States Power Company, chairman. Eastern Oregon Light & Power Company: J. B. Brokaw. Grays Harbor Railway, Light & Power Company: H. J. Flagg. Idaho Power Company: F. J. Ranklin. Northwestern Electric Company: O. L. LeFever. E. F. Pearson. Pacific Power & Light Company: H. H. Schoolfield. Portland Electric Power Company: D. W. Proebstel. R. R. Robley. C. C. Simeral. Puget Sound Power & Light Company: G. E. Quinan. R. E. Thatcher. The Washington Water Power Company: J. B. Fiskien.

The association also was represented at the joint use conference called by William Kelly, director of engineering, N.E.L.A., at headquarters in New York City, Sept. 29-30, 1925, by Z. E. Merrill, O. L. LeFever and M. T. Crawford. This conference, attended by 35 engineers from all parts of the country, was called for the purpose of defining the power industry's position as regards joint use of poles. It resulted in the drawing up of a set of principles and practices applicable for joint use. These were taken by the N.E.L.A. representatives on the joint committee as defining the industry's position in the matter and later were adopted to a great extent by the joint committee in Principles and Practices for the Joint Use of Wood Poles by Supply and Communication Companies. The adoption of these principles and practices by the joint committee composed of representatives of both power and communication companies has been a long step toward the settlement of a very vexatious subject. The association representatives justly are entitled to a share of the credit.

The usual amount of time and effort has been expended by all committees in co-operating with the National Section.

Annual General Meeting

The culmination of most of the work of the section for the year was the third general meeting held at the Olympic Hotel, Seattle, March 11-12, 1926. Each committee contributed a portion of the program and indeed it would be a difficult task for one to decide which portion was the most interesting or most important. The registered attendance was 151, exceeding that of any previous year.

The presence of Col. William Kelly from headquarters was an inspiration to those in attendance and did much to bring the Northwest Section and the National Section into closer relation and a better understanding of their respective problems.

Perhaps the outstanding feature of the meeting

was the address of Franklin T. Griffith on Relation of Employees to the Public. This address was of a high order and attracted a number of member-company executives to the meeting. These, we believe, were favorably impressed with the work being done by the section as evidenced by the attendance and general interest.

In connection with the general meeting it is desired to direct attention to a resolution passed by this committee and published in the Proceedings of the third general meeting of the Technical Section. In this resolution the committee goes on record as absolutely opposed to any entertainment features in connection with general meetings that will interfere with or detract from the business of the meeting.

Insulator Tests

A portion of the insulator tests under way at O.A.C. laboratory have been completed, but the remainder will not be finished until the laboratory is able to secure additional equipment. The importance of completing this work cannot be exaggerated, both to the association and to the industry in our section. The committee urges that every possible assistance be rendered to the end that the necessary equipment be secured and the work completed. The Oregon Agricultural College is the only school in the Northwest that has a nucleus of a high-voltage testing laboratory and it should be assisted in its efforts to enlarge this nucleus to proportions that will be of a value both to its students (future engineers) and to utilities operating in the Northwest.

The committee recognized and has gone on record as appreciating the fine co-operation and very material assistance rendered by the engineering faculty and students of the Oregon Agricultural College.

In conclusion the committee desires to acknowledge the able assistance and co-operation rendered by the president, and by the secretary throughout the past year.

Accident Prevention Committee Report*

The accident prevention committee has not held any meetings during the year. The work has been done chiefly by correspondence, but the chairman has had several opportunities to hold conferences with different members of the committee at which the work of the committee has been discussed.

National Co-operation

The committee has kept in close co-operative contact with the national committee throughout the year, the chairman being an ex-officio member of that committee.

Two subjects were referred by the national committee to this local committee: safe practices pamphlets and tree pruning.

With regard to safe practices pamphlets the prevailing opinion among the members of this committee was that members would make little use of such pamphlets and the time and trouble in preparing them would not be justified when the benefit accruing to members was considered.

With regard to tree pruning, suggestions were submitted and were given consideration by the national subcommittee on underground and overhead systems. This committee also was asked to report on methods of identification of cables. This was done, report being made to the underground and overhead systems subcommittee.

The Washington Water Power Company was asked to report on its methods of temporary safety grounding. This it did, and no doubt other member companies furnished similar information.

The chairman was appointed a member of the underground and overhead systems subcommittee which was appointed to investigate and report upon protec-

tive methods particularly with reference to overhead and underground systems. This subcommittee has had under consideration the two subjects referred to above.

The national accident prevention committee is not following the plan of assigning definite subjects to any one divisional committee for report, but is handling all its subjects through subcommittees. The same subjects may be assigned to two or more divisional committees for report to the subcommittee.

The national committee has held six meetings during the year, two of them during the group meetings of the Technical Section at Detroit and at Kansas City.

This committee was not represented at Detroit, but the chairman was present at the Kansas City meeting.

In the opinion of the committee the Kansas City committee meeting was a failure; only the national chairman, two members of the committee, one alternate and four conferees were present. This fiasco no doubt was due to the fact that for some unaccountable reason another meeting was called for the following week in New York and the leading men in the committee stayed away from Kansas City.

The committee is of the opinion that the national committee is too intensive in its work. It desires to initiate a subject in the fall and have it completely covered by a report by the middle of the winter. It is probable that no difficulty is experienced in getting all data desired from the eastern companies on account of the large staffs in all their departments and the close association which these companies have with one another, but such a condition does not exist in the territory of this association. We cannot on account of our condition do things that way.

Insull Medal

During the past year three Insull medals have been awarded to employees of member companies.

On Dec. 1, 1925, the chairman acting as Samuel Insull's representative presented a medal at Medford, Oregon, to Howard Dynan, an employee of The Cali-

* J. B. Fiskien, The Washington Water Power Company, chairman. Eastern Oregon Light & Power Company: J. B. Brokaw, Idaho Power Company: E. C. Kiersted, Mountain States Power Company: W. B. MacDonald, Walter Smith, Pacific Power & Light Company: G. I. Drennan, Puget Sound Power & Light Company: E. H. Worthen, Utah Power & Light Company: F. E. Hansen, Portland Electric Power Company: C. F. Young.

fornia Oregon Power Company for the successful resuscitation of a fellow employee, B. T. Green, on June 3, 1924.

On Jan. 25, 1926, G. B. Horning, vice-president and general manager of the Utah Gas & Coke Company, acting as Mr. Insull's representative presented a medal at Salt Lake City, Utah, to C. V. Catron, an employee of the Utah Power & Light Company for the successful resuscitation of George Denning, a farmer at Iowa, Idaho, on March 24, 1925.

On March 30, 1925, at Klamath Falls, Ore., Ted Montgomery, an employee of The California Oregon Power Company, successfully resuscitated a fellow employee, Andrew Folsom. A medal has been awarded to Mr. Montgomery, but it has not yet been presented.

The committee considers it advisable again to call the attention of the member companies to the Insull medal.

This medal is awarded by Samuel Insull of Chicago to any employee of a member company who has, by the Schaefer prone-pressure method of resuscitation, restored natural breathing to a person who has succumbed to suspended respiration as a result of electric shock, and who has by the prompt and intelligent application of this method prevented the death of such person from suspended respiration due to electric shock.

In cases where the person has been so resuscitated and after an appreciable lapse of time succumbs from other causes such as burns or bodily injury, awards will be made the same as though the person had survived.

Either the employee performing the resuscitation or the employing company should report the case to the chairman of the accident prevention committee who will furnish the necessary application blanks, make an investigation of the circumstances and report to the national committee.

The committee strongly urges that all company members insist that all their employees be instructed and trained in principles and practices of the Schaefer prone-pressure method of resuscitation.

Hay-Derrick Hazard

The committee is not yet ready to submit a full report on the hay-derrick hazard. A considerable amount of additional data on hay-derrick accidents has been secured during the year and the committee recommends that these data, with such other data as can be secured, be used next year in compiling a complete report.

The committee again would recommend that the association take steps to secure legislation covering the moving of hay derricks, in the interest more of the farmers and their employees than of the member companies, in the belief that the data available is sufficient to justify the enactment of remedial legislation.

Radio Aerial Hazards

The committee is not yet ready to submit a full report on the radio aerial hazard, but believes that this can be done early next year. Many fatalities have been reported during the year and while most of the member companies are doing all in their power to prevent accidents from this cause, they can be only partially successful owing to the lack of legislative rules governing the erection of radio aerials.

A particularly distressing accident, which resulted in the death at Vancouver, Wash., of 7-year-old James Greenwood, was the subject of a circular issued by H. P. Coffin, manager Public Safety Section, Columbia

Basin National Safety Council and approved by C. A. Rich, superintendent of public schools, Portland, Ore.

This circular, addressed to school principals of school district No. 1, Portland, Ore., read as follows:

Last week a school boy touched a wire lying on the ground. Instantly 2,200 volts of electricity passed through his body and he fell over dead. This wire had been fastened to fir trees to serve as a radio antenna. Between the tree and along the road several wires of an electric company were strung on poles. During a storm the trees were blown back and forth and the wire was broken and fell over the service line and the current passed down the broken wire into the ground.

Wires on the ground or hanging down are extremely dangerous. Boys and girls should not touch them, but call up the police or fire bureau and report the location of the broken wire.

Many places in our city radio wires have been strung unlawfully and if broken are liable to cause death or serious injury to anyone coming into contact with them. Your attention is called to the following section of ordinances covering the stringing of wires:

Ordinance No. 32923; Sec. 1, Art. VII: Erection of Poles and Wires—"It shall be unlawful for any person to erect any pole or stretch any wires in, under or over any street, alley, park, public way or public ground for any purpose whatsoever unless a permit or franchise therefor has been granted by the council."

Electric Code No. 3501; Par. E.—"No antenna or counterpoise shall be constructed over a street or public property, over or under any electric-light or power wires of any circuit of more than 600 volts or any railway trolley or feeder wires, without a permit so to do having first been granted by the council and then only in accordance with such requirements and safeguards that shall be contained in such permit."

Please have this letter read in every room of the school of which you are in charge, at your earliest convenience.

This circular was read in each school room and to each platoon of police.

At the annual general meeting of the Technical Section two very interesting and instructive papers were presented and discussed.

M. E. Arkills, safety engineer, Waterfront Employers of Seattle, in his paper entitled *The Economic Value of Accident Prevention* proved very conclusively that accident prevention activities paid dividends.

G. I. Drennan, a member of this committee, gave a very interesting paper on *Selling Safety*.

The committee urges that all executives of member companies read these papers and the discussion. By doing so ways may be seen whereby operating costs may be reduced.

Attention also is called to two opinions, both in the same case, handed down by the supreme court of the state of Oregon under date of March 16, 1926.

The facts in the case were:

A member company operates and maintains a power line in Oregon, and in constructing and operating said power line the same was built across a tract of land occasionally used as a public park and which was situated near a school ground. In constructing the line it was necessary to remove the top from a large tree and in doing so a portion of the tree, approximately 16 ft. in height, was left standing.

On the day of the accident to a youth of the age of 12 years, a group of children had repaired to the tract of land upon which the tree was located for the purpose of having a picnic. Several of the boys climbed the tree, and one came in contact with the wire and lost his life. By reason thereof judgment has been entered against the power company for approximately \$12,000. The court in deciding this case, applied what is known to the law as *The Attractive Nuisance Doctrine* which is applied in a great number of cases such as turn-tables, swimming pools, fish ponds, etc. In other words, the court held the defendant in this case liable on the grounds that the tree left as it was, was an "attractive nuisance" and charged the defendant with knowledge of knowing the usual propensity of children to climb trees.

Because the users of the service of public utility companies must of necessity pay all the costs of furnishing that service this decision, which is now the law in Oregon, imposes an additional burden on those citizens of the state who desire to make use of the service.

Electrical Apparatus Committee Report*

The apparatus committee during the year just closing has functioned as in previous years in a two-fold manner. It has acted as the northwest geographic divisional representative of the apparatus committee

of the N.E.L.A. and as such has aided the national committee in collecting data on subjects being studied. It also has worked on several subjects of local interest some of which were used as a basis for the apparatus committee program presented at the general meeting of the Technical Section held in Seattle, Wash., March 11-12, 1926.

Work with National Committee

Several of the subcommittees of the national apparatus committee sent out questionnaires asking for

* D. W. Proehstel, Portland Electric Power Company, chairman. Idaho Power Company: T. A. Purton. Mountain States Power Company: George McClellan. Northwestern Electric Company: W. C. Webster. Pacific Power & Light Company: C. S. Knowles. E. R. McClung. Portland Electric Power Company: E. A. Woodhead. Puget Sound Power & Light Company: Joe Hellenenthal. Utah Power & Light Company: Walter Hendron. The Washington Water Power Company: Richard McKay.

data relative to performance, maintenance and operation of several classes of electrical apparatus. Some of them asked for data which might be used to bring about the betterment of apparatus, while much of it had little but statistical value. Some of the subjects commented on below may be of special interest.

Oil Sludging in Power Transformers

The subject of oil sludging in high-voltage power transformers is one that is attracting widespread interest. The national apparatus committee therefore is attempting to determine the relative improvement that may be gained in regard to oil sludging by using the conservator or gas-filled type of transformer instead of the open type. Nearly all of the operating companies in the Northwest have experienced trouble with oil sludging in nearly all of their non-conservator, open-type transformers, and little or no sludging in the conservator types. Nearly all of the latter type, however, are new units and have not been in operation long enough perhaps for bad oil sludging to develop. Experience with oil in the open types has brought about a general plea for improvement in the quality.

This study is a new one and considerable time will be required to accomplish the improvements desired.

Power Factor Improvement

This problem always is before the national committee for the reason, it would seem, that no satisfactory solution can be found. It has been divided into two parts, power-factor or voltage regulation at distribution stations, and the practice of limiting directly or indirectly the power factor characteristics of small a.c. motors on distribution circuits.

The companies in the Northwest in general are using synchronous condensers or other synchronous apparatus to aid in maintaining regulation at central distribution stations. This is common practice and is valuable with respect to station voltage regulation and the lessening of losses on transmission lines and outlying generating plants, but does not provide the benefits to be desired on the distribution circuits themselves.

In order to obtain these desired benefits it will be necessary to deal with the second phase of the power-factor improvement problem. Very little attention has been given to this part of the problem by the companies in the Northwest due perhaps to the fact that there are very few factories that operate large groups of small or fractional-hp. motors.

Rating of Electrical Apparatus

Inquiry as to the conditions under which apparatus is operated in the Northwest reveals the fact that, in general, the manufacturers' nameplate ratings are accepted and only in a few cases have the operators either over-rated or derated the equipment for voltage, current-carrying capacity or interrupting capacity.

Generators and other rotating machinery usually are operated nearly at rated voltage. High-voltage power transformers seldom are operated above rated voltage, but often below voltage. The receiving transformers in distribution stations, however, quite often are operated at voltages in excess of their ratings; 2.4 kv. transformers will be operated 2.4 kv. and 11 kv. transformers from 11 to 11.5 kv. This condition has been brought about as a result from a demand for higher voltage on distribution buses and has in many cases subjected induction regulators rated at 2.2 kv. to continuous operation at voltages considerably in excess of their rating. Many companies, on this account, are ordering regulators for a voltage rating of 2.6 kv. Oil circuit breakers, disconnecting switches, bushings and instrument transformers generally are operated at voltages below their rating.

The manufacturers' current rating of apparatus usually is accepted and seldom increased or decreased by the operator. In some cases, however, transformers and generators are operated at higher current values than those of normal rating because temperatures and other conditions so permit.

Interrupting ratings of oil circuit breakers usually are accepted. The operating companies have little means to determine whether or not they should be otherwise. In a number of cases, however, old-type

circuit breakers have been considered unsafe for heavy interrupting duty and have been derated and installed in locations where interruption requirements are less.

Questionnaires were sent out by other national subcommittees on several other subjects such as inspection and maintenance of apparatus and equipment, life of generator insulation, and current-limiting reactors. Answers to the first two inquiries show that the policies followed by the several companies with respect to routine of inspection, repairs of equipment and reinsulating of generators differ widely. The national committee no doubt will give some valuable data on these subjects in their progress reports and perhaps will outline some desirable routine methods of inspection and maintenance of electrical equipment. Current-limiting reactors are not in general use in the Northwest geographic district. The demand for their use, however, is growing as the capacity of the systems is increased.

Third Annual General Meeting

The apparatus committee presented its part of the program of the general meeting of the Technical Section of the Northwest Electric Light and Power Association during the afternoon of March 11, 1926. There were presented three papers, one on the subject of Mechanical Troubles with Late Types of Oil Circuit Breakers, by D. W. Froebstel; the second on Differential Protection and Neutral Grounding of Generators and Transformers, by R. Rader of the Puget Sound Power & Light Company; and a third on New Electric Applications in the Paper Industry, by C. W. Fick of the General Electric Company. These papers together with the discussions which followed their presentation will appear in the printed proceedings of the meeting.

The paper on mechanical troubles with late types of oil circuit breakers pointed out that most of the troubles come from insufficient and improperly located oil drains from oil leaks, lack of proper mechanical clearances of the moving parts of closing and tripping mechanisms, contacts, lack of drains in horizontal pipes inclosing operating rods, and from inaccessible parts. While it was pointed out during the discussion that most of these defects have been corrected in oil circuit breakers designed during the past year, much good no doubt will come from calling these defects to the attention of the manufacturers. It will help to prevent their recurrence in breakers yet to be designed and presented to the market.

The next paper on the subject of Differential Protection and Neutral Grounding of Generators and Transformers, reviewed the history of relay protection of equipment from internal failure and circuit trouble. It described the principles of differential relay protection and its application to generators and transformers. Grounding of generator Y points and of the neutrals of Y connected transformers was discussed. It was pointed out that the main advantages of differential protection are in minimizing interruptions to service and damage to apparatus.

The final paper on the subject of New Electrical Applications in the Paper Industry contained several interesting descriptions of departures from longstanding practice in the manufacture of paper. The electrical boiler for generating steam for use in the various pulp and paper processes was described. Comments were made about its convenience and relative economies. It was pointed out that while the cost of electrical energy per pound of steam was much higher than the cost of coal much advantage was gained by a decided reduction in operation and maintenance costs. The substitution of electrical heaters and traveling screens for drying the paper in the paper machines for the long-used steam rolls was vividly described. Another feature of the paper was the description of the super-synchronous motor and its use in driving pulp beaters, grinders, etc., where heavy starting torque is needed. This motor is arranged so that both the field and the armature can revolve in separate bearings. In starting, the field, which is connected to the driving shaft, remains stationary while the armature is brought to synchronous speed. A brake then is applied to the armature giving full running torque to the field for starting the machinery which it drives. The field reaches synchronous speed at the instant the armature stops. This

paper brought out a great deal of very interesting discussion.

Problems Now Being Studied

An interesting problem that has been proposed by the national subcommittee on transformers and regulators is that of attempting to develop standards for 3-winding transformers. There seems to be a growing demand for this type of transformer which may be operated on 3-power circuits in contrast to the now common transformer with a tertiary winding which is

used for regulation purposes in connection with a synchronous condenser.

The apparatus committee of the Northwest Electric Light and Power Association has initiated the request that the manufacturers furnish more design data on the nameplates of generators and other revolving apparatus. This matter will be taken up with the manufacturers through the national committee when a complete expression has been made as to what the scope of the data should be.

Inductive Co-ordination Committee Report*

During the past association year there have been no developments of importance in the field covered by this committee. The work of the national committee has been followed with close attention and the interim report on allocation of cost has marked a definite advance in the slow, but sure progress to a complete solution of inductive problems.

The committee was represented during the year at a hearing held by the Public Service Commission of Oregon, at Cascade Locks, to consider complaints received by it concerning interference to radio reception alleged to be caused by the power lines of a local small company. The decision of the Oregon commission appears to be that they are not anxious to ac-

cept jurisdiction of radio interference cases, but recognize their responsibility for dangerous construction in the power system. A survey of the local power lines by a member of this committee revealed no serious condition in the power system, but did disclose that the principal complainant before the commission was using a receiving set which radiated very badly.

This committee is glad to be able to report that the field survey of parallels between power and telephone lines, completed several years ago and revised and brought down to date last year for the state of Washington, this year has been extended through the assistance and courtesy of the Pacific Telephone & Telegraph Company engineers to include all parallels between power lines and lines of the latter company in Oregon and Idaho. Owing to the fact that this report is required a month earlier than usual it will be impossible to print the data this year, but it will be forwarded to the national committee and will be available at headquarters prior to the convention of the National Electric Light Association.

*G. E. Quinan, Puget Sound Power & Light Company, chairman. Grays Harbor Railway, Light & Power Company: H. J. Flagg. Northwestern Electric Company: L. H. Kistler. Pacific Power & Light Company: H. H. Schoolfield. Portland Electric Power Company: W. R. Cornell. Utah Power & Light Company: C. R. Higson. The Washington Water Power Company: J. B. Fiskens, E. V. Olson.

Hydraulic Power Committee Report*

During the year 1925 there was installed in the eleven states adjacent to the Pacific Coast about 300,000 kva. additional capacity of hydroelectric power.

The most important plants completed were:

Pit River No. 3, Pacific Gas and Electric Company.....	81,000 kva.
Hetch Hetchy, City of San Francisco.....	80,000 kva.
Baker River, Puget Sound Power & Light Company.....	39,000 kva.
Lake Cushman, City of Tacoma.....	37,300 kva.
Copco No. 2, California Oregon Power Company.....	30,000 kva.
Mystic Lake, Montana Power Company.....	12,500 kva.

In addition to the above new plants the Southern California Edison Company added a 25,000-kw. unit to its Big Creek No. 1 plant and a 16,000-kw. unit to Big Creek No. 2.

The subject of Hydraulic Packing was assigned to the Northwest geographical division of the association by the national committee.

Considerable data have been collected but the study has not progressed sufficiently to make a final report logical at this time.

Reports to date show the three principal packings used for hydraulic purposes to be braided flax, braided cotton, and Rains metallic packing.

Braided-flax packing has been used more extensively on large hydraulic units than any other type. It is objectionable from the standpoint of wear on the shaft.

Braided-cotton packing is of softer material, absorbs lubricant better, and gives promise of furnishing a more satisfactory packing than the braided flax. The short time it has been in use, however, precludes any definite conclusions.

Rains metallic packing is composed of about equal quantities of soft lead and white pine granules or small chips thoroughly lubricated by boiling in oil. Claims for this packing state that the wear on the shaft is small and that the life is far in excess of other packings on the market. All reports to date on this type of packing have been favorable.

*O. L. LeFever, Northwestern Electric Company, chairman. The California Oregon Power Company: R. S. Daniels. Grays Harbor Railway, Light & Power Company: W. S. Hills. Idaho Power Company: H. L. Senger. Pacific Power & Light Company: J. H. Siegfried. Portland Electric Power Company: C. P. Dunn. Puget Sound Power & Light Company: G. C. Sears. Utah Power & Light Company: J. A. Hale. The Washington Water Power Company: E. H. Collins.

The papers presented at the general committee meeting of the Technical Section held in Seattle, Wash., March 11-12, 1926, comprised a part of the committee's work for the year. On account of the large amount of data included in these papers only a brief abstract will be possible in this report:

Paper on Rock and Earth-Fill Dams by Lyman Griswold

A competent engineer when confronted with the problem of dam construction will first analyze the conditions surrounding the site and after acquiring all of the facts obtainable proceed to design a dam which will at the lowest possible cost produce the greatest amount of revenue by utilizing to the greatest possible extent the resources available.

In the Northwest the most economical development of many of our river systems can be had only by using some dams of the earth and rock-fill type.

Engineers not familiar with this type of construction are apt to assume an element of danger in connection with their use. Engineering history proves that such fears are ungrounded. In two provinces in India there are 90,000 of these dams built to a height of 70 ft. and constructed by natives who had no knowledge of strains or stresses or theories of percolation. They knew by long experience that earth embankments, with the side slopes allowed to take their natural angle of repose, were safe against the pressure of the water.

A properly constructed earth or rock-fill dam with natural slopes of one and one-half to one or flatter inherently is more stable than any of the approved types of gravity concrete dam.

There is no evidence of the failure of an earth or rock-fill dam of any importance except where inadequate spillway capacity has permitted the structure to be overflowed, when its immediate failure is inevitable.

The essentials for a satisfactory earth or rock-fill dam are much the same as for any other type excepting that foundation requirements are much simpler. It seldom is necessary to excavate the bed of a river preliminary to constructing a dam of this type. The Rimrock Dam, which is of rock and earth fill, is 230

ft. in height and rests on 110 ft. of river silt, sand and gravel.

Paper on Economics of Hydroelectric Design by C. P. Dunn

Here in the West we are confronted with the task of choosing the best from among a great many possible hydroelectric developments. Our duty to the communities we serve demands that the water power and irrigation projects of the district be developed in the proper order and in the manner which will result in the greatest good to the greatest number of people.

We always must keep in mind that the thing of prime importance is system efficiency, not machine or station efficiency. Good hydraulic, mechanical, and electrical efficiency is not enough; commercial efficiency in its broadest sense, must be achieved.

Correct solutions of the broader economic problems of hydroelectric design are obtained only by studying the loads and generation of the entire system or geographical district. Due consideration must be given to the fact that the greatest economy usually is obtained when a part of the generation is steam, even in this locality where water-power sites are so abundant.

The value of a kw-hr. is determined not by the fact that it is a definite amount of energy, but by the ability or inability of the seller to deliver it, on de-

mand, at any hour of the day or night or at any season of the year. Electric service consists of carrying both peaks and kw-hr. The mention of either without a very specific definition of the relation between the two results in an incomplete description of the service in mind. The quality of service which will be demanded of a plant has a very definite and very important bearing on the design of the structure and mechanisms of which it is composed. This is the very fundamental of plant design; a power station should be built to fit the work it will have to do.

Before undertaking the detail design of a project it is necessary to get a comprehensive picture of the problem as a whole in order that the proper relative importance of things may be established. These things are as follows:

1. Rating of existing system.
2. Load forecasting.
3. Determination of general construction program.
4. Determination of general features of individual project.
5. The value of power.

The committee prepared for the national committee data covering the mechanical reliability of water-power plants throughout the Northwest together with the answering of various other questionnaires of a lesser nature.

During the ensuing year the committee will continue its study on hydraulic packing.

Overhead Systems Committee Report*

The activities of the overhead systems committee during the past year as is customary have been directed along two general lines, a consideration of problems of local interest and co-operation with the national overhead systems committee.

The outstanding accomplishment of the past year has been the completion of the tests of pin-type insulators of the 13-kv. class by the electrical engineering students of the Oregon Agricultural College under the supervision of Prof. F. O. McMillan.

The idea of having these tests made was conceived about two years ago and the subject has been one of live interest ever since. Lack of adequate transformer equipment will prevent the completion of the tests on the 44 and 66-kv. insulators this year. Replies to a questionnaire sent to all members of the committee relative to live-line maintenance methods reveal the fact that but one company does any work on lines carrying more than 13 kv. and that company limits such work to the replacement of defective insulators and occasional crossarms. One or two more companies do a limited amount of work on lines of the 6.6 and 13-kv. class, but confine such work to the minimum necessary to keep the lines in service without interruptions.

Practically all larger companies belonging to this association use some method of testing insulators on live lines such as the Johnson, Iler or Doble sticks. It generally is conceded that while this method is far from infallible, many defective insulators are located and removed before they have totally failed and many interruptions are averted.

At the beginning of the association year the matter of having comparative tests made by these methods at the Oregon Agricultural College was considered. The principal idea was to determine, if possible, to what extent the personal equation might affect the results obtained. There seems to be some contention between some of the manufacturers of this equipment relative to infringements of patents and we think it advisable to postpone these tests for the time being.

Questionnaires on maintenance methods and practices, and practices relative to overhead crossings of railroads have been sent out to the member companies at the request of respective chairmen of subcommittees of the national overhead systems committee. Replies were forwarded to the proper parties.

Virtually no data have been collected relative to the life of treated and untreated poles. Committee members reported difficulty in collecting the desired information. This matter was discussed at the general meeting in Seattle and better understanding of the subject obtained and it is assured that something may be accomplished during the next year.

This committee was represented at two of the meetings of the national overhead systems committee by Z. E. Merrill at the meeting in Detroit and by R. R. Robley at the meeting in Kansas City.

The national committee has issued no serial or other reports up to the time that this is written. Consequently, there can be no review of its accomplishments.

Next year's work should see the completion of the insulator tests under Professor McMillan's supervision, providing that the proper transformer can be obtained.

The collection of data relative to the life of poles also should bring some definite information.

The chairman believes that this committee would be of more value if each member would, at the beginning of the year, submit some subject for consideration and also make use of the committee as a clearing house of ideas regarding individual problems which may arise from time to time.

* J. B. Brokaw, Eastern Oregon Light & Power Company, chairman. California Oregon Power Company: C. D. Wood. Coast Power Company: L. W. Edwards. Idaho Power Company: T. A. Purton. Northwestern Electric Company: D. A. Hard. Oregon Agricultural College: F. O. McMillan. Pacific Power & Light Company: R. J. Davidson. Portland Electric Power Company: H. R. Wakeman. Puget Sound Power & Light Company: M. T. Crawford. A. C. Riggs. Utah Power & Light Company: P. P. Ashworth. The Washington Water Power Company: L. R. Gamble. Western Electric Company: H. J. Billica.

Prime Movers Committee Report*

The work of the prime movers committee during the past year has been devoted to the preparation of data requested by the national committee as well as to the study of local problems. These local problems are:

- Equipment for handling hog fuel.
- Furnace design applied to present hog-fuel burning practices.
- Operation of mechanical soot blowers on hog-fuel fired boilers.
- Packing for centrifugal pump shafts and turbine control-valve stems.
- General trend of heat-balance control in the Northwest.
- Possibility of the utilization of low-grade western lignites in the form of powdered fuel.
- Review of the causes of caustic embrittlement.

All of the foregoing subjects with the exception of the last two were presented at the general committee meeting held in Seattle, Wash., March 11-12, and are included in the proceedings of that meeting.

Two written discussions were prepared, one on the paper entitled *Furnace Design Applied to Present Hog-Fuel Burning Practices* and the other on *Operation of Mechanical Soot Blowers on Hog-Fuel Fired Boilers*. The former discussion was prepared by J. E. Yates, assistant chief engineer of the Pacific Power & Light Company, Portland, Ore. The latter discussion was prepared by Darrah Corbet, associate manager of Chas. C. Moore Company, engineers, Seattle, Wash. Due to the lack of time at the Seattle meeting it was impossible to present these discussions and they are included herewith.

In conclusion the committee recommends the continuation of study along the lines of this year's work and urges a greater co-operation between the various member companies in ironing out their problems encountered in the handling and burning of hog fuel.

* C. C. Simeral, Portland Electric Power Company, chairman. Grays Harbor Railway, Light & Power Company: W. S. Hills. C. C. Moore & Company: H. S. Bastian. Mountain States Power Company: W. C. McLagan. Northwestern Electric Company: Tom Perry. Pacific Power & Light Company: J. E. Yates. Puget Sound Power & Light Company: E. W. Seckendorff, R. S. Carroll.

Discussion on "Furnace Designs Applied to Present Hog Fuel Burning Practices"

By J. E. YATES

The use of sawmill refuse or hog fuel as it is commonly known as a fuel under boilers for the generation of steam has been restricted largely to the northwest section of the United States. It is in this section that timbering operations make this type of fuel available and in some sections it has largely supplanted coal or oil as a boiler fuel, because of its abundance and consequent cost advantage.

Problems in connection with the utilization of this kind of fuel of necessity must be confined to the territory where it is available. This means that users of hog fuel for the generation of steam assisted by interested manufacturers must work out their own problems.

Public utility companies in the Northwest and particularly those operating properties on the western slope of the Cascade Mountains have realized the utility of sawmill refuse as a fuel and today are depending upon this type of fuel to supply a good percentage of their steam requirements. Consequently the information contained in this paper relative to improved designs in hog fuel furnace arrangements is very encouraging.

The Pacific Power & Light Company has one steam plant containing 1,800 hp. in boilers where sawmill refuse is the main fuel for the boilers, the arrangement being such that oil is available as an emergency fuel. The boilers are equipped with dutch ovens, flat arches and level grates. Fuel is fed intermittently into the top of the ovens, using four cones for each furnace. The bridge wall at first was built on an incline having a slope of approximately 60 deg. inclined

away from the fuel pile in the oven. This bridge wall recently was rebuilt to a vertical wall, its height decreased and pier and wing walls added. The addition of this refractory has improved combustion conditions in the furnace by quicker ignition of the fuel and a better mixing of the gases. This was accomplished without restricting the throat opening. The velocity of the gases over the wall is not excessive.

Observation after this refractory had been added indicated an increased boiler evaporative capacity of from 145 to 190 per cent of the manufacturers' rating with the same intensity of draft available at the boiler damper, a decrease in the degree of care and manual labor on the part of the firemen, and a decrease in the stratification of the gases.

It would appear that the inclined grate furnace with an even depth of fuel the entire width of the furnace would give better combustion results than the cone method providing the same area of exposed refractory can be maintained and a good mixing of gases secured. The sloping grate would make a hot fire near the foot of the grate where the fuel is burning briskly and a cooler fire toward the top where the fuel is just igniting and where the moisture in the fuel is evaporating. This condition might cause stratification of the gases. If the operating companies have had any experience along this line it would be interesting to have further discussion on the subject.

A. O. Jackson has a patent on a process for burning hog fuel that admits air through a draft door below the grate and fuel bed causing the carbon to burn instead of melting down on the grate bars or passing unburned through them into the ash pit. The fuel gases rising from the fuel are mixed with air coming from a second draft door above the fuel bed, resulting in a complete combustion of the fuel.

Mr. Jackson has equipped a tow-boat with a hog-fuel furnace patterned after his ideas and it was demonstrated on the Columbia River before several engineers late in 1925. This tow-boat is a rear-wheel propelled, steam-operated boat equipped with two 700-hp. Ballin boilers having dutch ovens which are automatically fired with hog fuel. About one and one-half hours is required to get steam up from a cold boiler.

Hog fuel is delivered into the dutch ovens through tubes having a revolving shaft in the center, to the bottom of which is fastened a conical-shaped casting which rests on a cast-iron circular grate. The fuel accumulates on this grate in conical form with the depth on the grate regulated by a telescoping feed tube controlled from the top of the oven. On this particular installation the fuel cone is restricted to a 42-in. diameter and the depth of the fuel at the rim of the cone is regulated to a depth of 2 in. It burns freely up to the edge of the cast-iron cone resting on the grate which is about 30 in. in diameter. Air is admitted through doors below the combustion chamber and the heated gases pass upward through the tubes. The cast-iron cone revolving and the downward flow of the fuel force ashes from the grate.

No performance data are available on this furnace, consequently nothing more can be said about it at this time. Some temperatures were taken during the demonstrations that would indicate a maximum temperature somewhat in excess of 2,200 deg. F.

So far Mr. Jackson has had no experience in installing more than two fuel-cones in one oven.

Forced draft is not necessary with this installation, neither did the grates appear to clog or heat. The incoming air tends to keep the grates cool; in fact the draft made the space between the settings the coolest place on the boat.

At the present time the claim is made for the furnace that it saves operating expenses over the previous oil-fired furnace. In this respect it is typical of a good many hog-fuel installations. About the only specific thing known about the use of sawmill refuse under boilers in this district is that it is more economical than other types of fuel.

Discussion on "Operation of Mechanical Soot Blowers" on Hog-Fuel Fired Boilers

By DARRAH CORBET

I am well acquainted with the performance of soot blowers in the plants of the Northwest and I agree that, in some cases, their economical performance can be questioned.

Before we closed contract with the Long-Bell Lumber Company for its power plant at Longview we very frankly told them how soot blowers were regarded by the electric companies in this district and took their representative to various plants and showed him the results that were being secured. Nevertheless, the Long-Bell company decided to install soot blowers and we are pleased to note they are satisfied with their performance and report favorably upon them.

Practically all of the plants reported on by Mr. Perry have Stirling boilers and it is my judgment that, on account of its design, the Stirling boiler will free itself quite readily from the light soot deposit incident to mill-refuse fuel. However, if there may be intermittent firing with other kinds of fuel, such as oil, it is very desirable to remove the soot entirely before firing oil as otherwise it is apt to fuse to the heating surface.

There are various other types of boilers which do not free themselves from the light wood-ash as does the Stirling boiler. With these boilers mechanical

soot blowers show up to better advantage than on the Stirling. This is particularly noticeable in boilers having the tubes very close together such as the old Shipping Board boilers. There is a plant in Seattle where I installed mechanical soot-blowers which gave excellent service with mill-refuse fuel where previously it had been necessary to get in periodically and actually saw out the ash and slag.

The harder a boiler is fired the more desirable are mechanical soot-blowers. I believe they should be installed on all boilers that are expected to operate at very high ratings.

I believe Mr. Perry has overlooked many features of the mechanical soot-blower when he states that their only justification may be the fuel saving which they effect. I would say that in addition to the fuel saving they might be justified by reason of the additional capacities which they help secure, the saving in repair and up-keep, the elimination of danger of ash accumulation causing corrosion and possible subsequent leakage, a saving in labor, and ability to get up steam rapidly in emergencies.

I know of many instances where there is a decided accumulation of ash and soot on the boiler or superheater surface where mill refuse fuel is fired. A mechanical means for removing this would be desirable. The writer would be able to refer to many plants where sawmill refuse is fired and where the best of service is secured from mechanical soot-blowers.

Underground Systems Committee Report*

The committee considered the advisability of studying the design and installation of high-voltage cable for the past year's work. However it was decided that inasmuch as several high-voltage installations were proposed and under construction in the East at the present time it would be better to await the operating results obtained from these installations and reserve this study and report for next year's work. The committee decided to base its study upon two subjects: Auxiliary Underground Apparatus other than Cable and Proper Ventilation of Transformer Vaults and Duct Lines.

X-Ray Cable Tests

In addition to the results obtained from studies on the above subjects some very interesting data on use of X-rays in determining the condition of cable insulation were received from M. T. Crawford, superintendent of distribution for the Puget Sound Power & Light Company. Mr. Crawford's report is as follows:

This development of the use of X-rays on cable was the outgrowth of an extensive series of failures on a 6.6-kv. rubber-insulated unarmored submarine cable which was installed from Des Moines to Vashon Island in 1917. It was found that there were a number of air pockets or gas bubbles in the wall of the rubber insulation at places, the result of imperfect vulcanization at the time of manufacture.

This cable was about 12,000 ft. long and laid in salt water, reaching a maximum depth of about 750 ft. We had to install a new cable alongside it to get satisfactory results and now we are about to install two more submarine cables from Richmond Beach to President Point on the Olympic Peninsula, crossing the channel where it is about four miles wide and with water depth close to 800 ft. These cables are to operate at 15 kv. On account of the trouble we had with the old cable and the necessity for reliable operation on the new installation we made an extensive investigation of all phases of the work including the making of satisfactory high-voltage rubber splices. In connection with this work the use of X-rays was developed by F. E. DeSilvia, general foreman underground lines for our company.

The perfect vulcanization of rubber is quite an art if uniform results are to be counted upon. Therefore we made a large number of test splices employing various methods. Mr. DeSilvia took a number of these together with samples of cable to one of the regular X-ray laboratories in the city and had X-ray photographs made for the purpose of determining whether or not all air pockets had been eliminated. As yet we have not used this method for examining splices made in the field, but now are investigating the practicability of doing so in connection with the new installation.

The X-ray will show clearly only voids or gas pockets in the rubber, decentralization of the conductor, or rough spots and imperfections in the conductor surface. The objections to it are the cost and the fact that only one plane is visible at each photograph, making it necessary to rotate the conductor to explore other planes or cross sections.

No doubt other applications of this method may be found later, such as finding the causes of insulator and equipment failures without tearing down or breaking up the materials and thereby destroying the evidence.

* E. F. Pearson, Northwestern Electric Company, chairman. Northwestern Electric Company: S. B. Clark. Portland Electric Power Company: J. M. Gillham. Puget Sound Power & Light Company: C. H. Hoge.

At the general meeting of the Technical Section of the N.W.E.L.&P.A. held in Seattle March 11-12, two papers were presented.

Review of Papers

One paper entitled Constructive Criticism and Suggestions for Future Developments of Underground Distribution System Apparatus other than Cable was presented by J. M. Gillham, superintendent of the un-

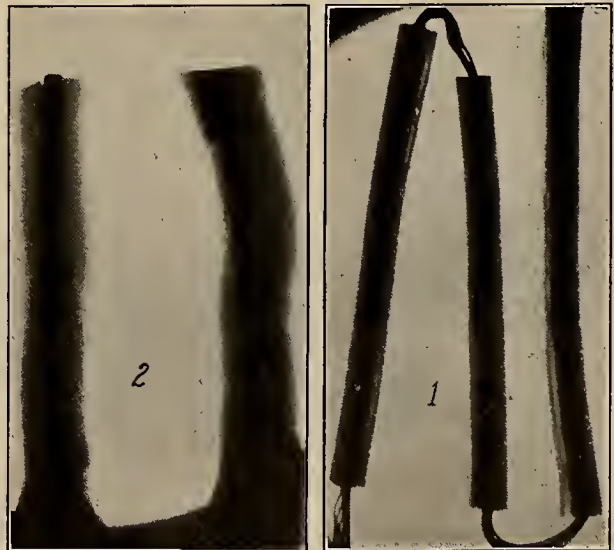


Fig. 1 shows what was accomplished. A piece of the original cable with the long gas pockets in the rubber formed by poor vulcanization and adhesion of the layers applied in the stripping machine at the factory, and the consequent opening up is shown at the right. An imperfect splice, the conductor being considerably decentralized, is shown at the left.

derground department of the Portland Electric Power Company. He was assisted in the presentation of this paper by J. S. Volpe, an engineer of the Portland Electric Power Company. A prepared discussion on this subject was presented later by C. H. Hoge, construction superintendent of the Puget Sound Power & Light Company. The reason for presenting a paper on this subject was the fact that the committee thought that the manufacturers have not given suffi-

cient thought to the development of underground apparatus such as circuit breakers, oil switches, fuses, and auxiliary apparatus. The paper and ensuing discussion called attention to several improvements that should be made in circuit breakers, oil switches, oil fuses, junction boxes, and other auxiliary underground apparatus.

The paper also brought out the facts that in general there is very little information published on underground engineering, principally because the men engaged in this work have not felt inclined to write their experiences for the benefit of the industries at large. Very little has been taught on this subject in schools and the young engineer has been obliged to get his information from practical experience supplemented by occasional magazine articles and the results of N.E.L.A. technical meetings. The paper was discussed further by J. B. Fisk of The Washington Water Power Company, H. H. Schoolfield of the Pacific Power & Light Company, O. L. LeFever of the Northwestern Electric Company, and F. L. Rohrbach of The Washington Water Power Company and others. Mr. Fisk complimented the writer on presenting a short and interesting paper and at the same time sounded a note of warning that enthusiasm in the subject of underground construction should not lead the various utilities to install underground equipment as opposed to overhead equipment except where absolutely necessary. This resulted in a somewhat spirited discussion for and against underground systems as opposed to overhead systems.

The chairman believes that this is strictly an economic question and should be so considered. In other words there is a definite place and time for an underground system as well as for the overhead system. Obviously it would not be proper to install an underground system where the less expensive overhead system would produce practically the same results at a lower cost. It is realized, of course, that the larger municipalities have in the past and in the future probably will arbitrarily require companies to place certain congested districts underground. Utilities should be prepared with a competent engineering force to

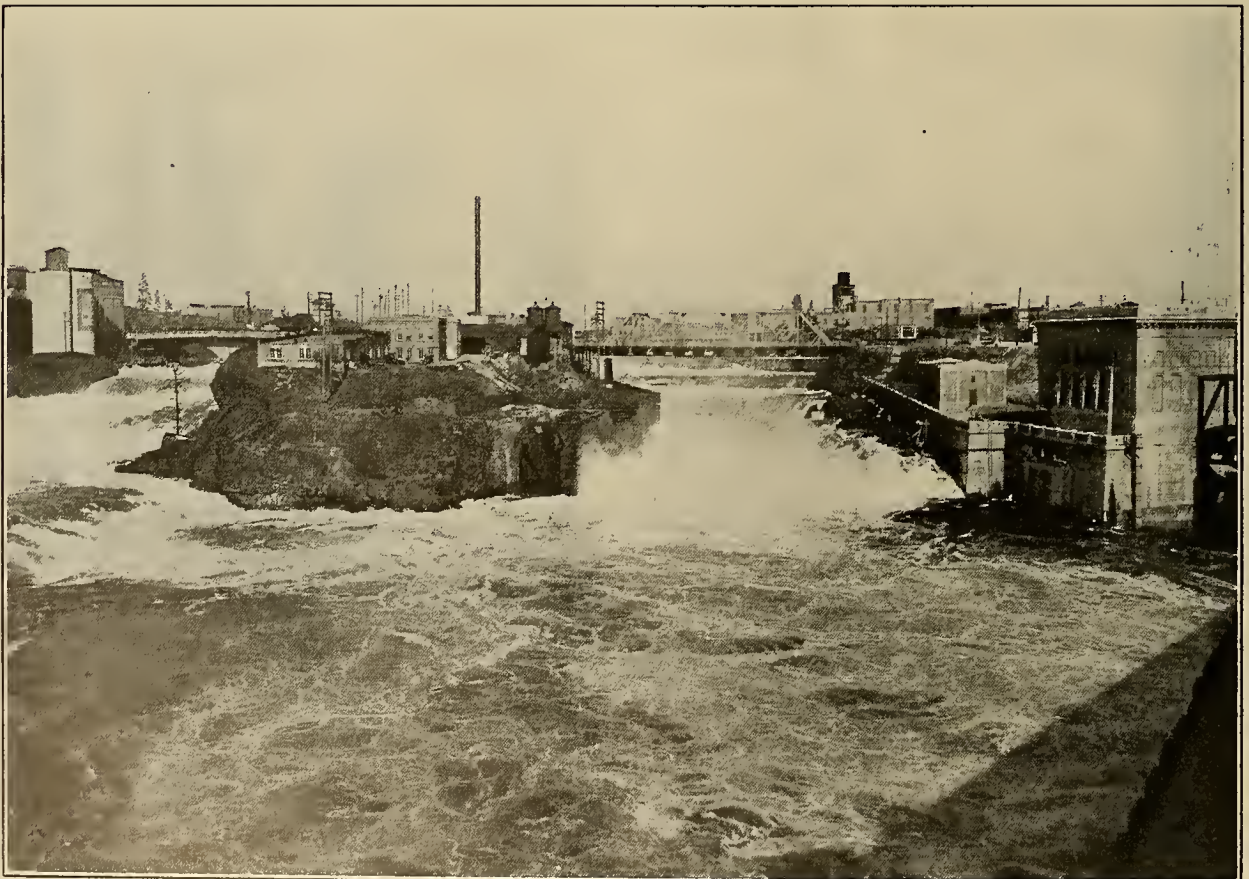
design and construct a practical and economical underground system when needed.

A paper entitled Underground Transformer Vault Ventilation was presented by S. B. Clark, superintendent of the underground department of the Northwestern Electric Company. A prepared discussion on this paper was presented by F. L. Rohrbach of The Washington Water Power Company. The paper and ensuing discussions provided considerable data on the experiences of the companies in the Northwest and in addition supplied data obtained through the circulation of questionnaires to utilities in the Southwest. The paper goes at length into transformer-vault wall heat-radiating values and the proper cubical space which should be allotted per kva. transformer capacity. It also outlines ventilating experience and makes recommendations on natural and mechanical ventilation systems for transformer vaults. Several members intended to discuss this matter but due to the limited time it was necessary to close the meeting after the prepared discussion had been submitted. It is the opinion of the chairman that this subject is one of vital importance to those utilities serving large metropolitan areas and that the problem is one that presents increasing difficulties as time goes on. It is believed that this paper and the discussion which followed will assist in the solution of some of the problems at least.

As the above papers together with the discussions will appear in full in the printed records of the technical meeting held at Seattle March 11-12, it was decided not to include them in this report. They may be obtained from the printed report of the Seattle meeting or the chairman will be very glad to furnish copies of these papers to anyone desiring them.

The chairman believes that this meeting was one of the most successful ever held. It was well attended and it is believed that those present appreciated the data submitted.

The chairman wishes at this time to express his appreciation of the efforts put forth by the various members of his committee in so ably presenting their papers, and to the other members of the committee who prepared discussions on the papers.



Upper Falls hydroelectric station of The Washington Water Power Company; capacity 10,000 kva. Plant is on Spokane River right in the heart of the city of Spokane

IDEAS FOR THE CONTRACTOR

Electrical Estimating for the Contractor — XI

Round and V Belt Problems Considered in this Article

Complete Data on Belting, Shafting and Pulleys

By J. R. WILSON*, Quality Electric Company, Los Angeles

To have complete data on belting, shafting and pulleys a few tables pertaining to round and V belts, and the computation of pulley and shaft speeds

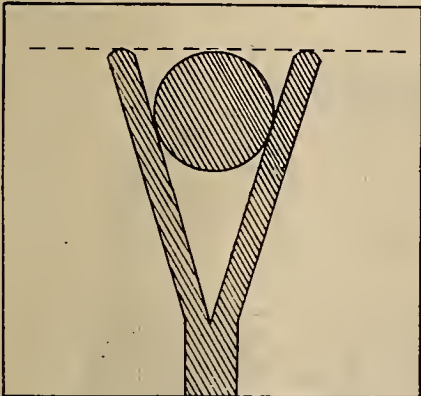


Fig. 1

Table 2

Width (In.)	Ply	Oak (In.)	Nutan (In.)
5/8	3	4 1/2	3 1/2
3/4	3	5	3 3/4
3/4	4	6	4
1	4	7	4 1/2
1 1/4	4	8	5
1 1/4	5	12	8

should be considered. While the estimator seldom will have need for data on round and V belts, it is almost impossible to obtain these data when

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needed. The data herewith are offered with that thought in mind.

The following rules and tables cover round and V belt drives with an angle between 29 deg. and 45 deg. While these types of belts are used on small machines such as sewing machines, small lathes and drills, etc., the data given are worked out to 9 hp. maximum for V belts and 14 hp. for round belts.

The right "center distance" to make a satisfactory drive is dependent upon the ratio of the two sheaves and particularly upon the diameter of the smaller sheave. Table 1 gives the recommended center distances for V belting. In using V belting several rules must be observed if the drive is to prove satisfactory. These rules are given below:

1. Never exceed a maximum of 3,000 ft. per min. for V belts.
2. If the center distance is too long it will allow the slack strands to sway, and if the speed is above 1,500 ft. per min. the belt very likely will jump off the sheaves.
3. The minimum pitch diameter for V-block belts is given in Table 2.
4. A 28-deg. sheave will transmit the most power but may not be the most suitable for a particular installation. A belt which is pliable will tend to wedge down into the sheave and this will cause changes in the pulley ratios.
5. Multiple-strand drives will not prove satisfactory because of the uneven wear upon the individual strands, this causing the pitch or diameter to vary. If more than one strand is necessary the best practice is to use a Lenix drive and a flat belt.

Below is given an example of a V-block belt drive. This is a drive for

a compressor. The details are as follows:

- 5 1/4 in., pitch diam. motor sheave.
- 3 hp. motor rating.
- 1,150 r.p.m., motor speed.
- 1,580 ft. per min., belt speed.
- 21 in., pitch diam. compressor sheave.
- 2 1/2 hp., compressor rating.
- 287 r.p.m., compressor speed.

Find required belt size and center distance.

Refer to Table 3; at 3 hp. with belt speed of 1,580 ft. per min. the size of belt is 1 1/4 in., 4-ply. Dividing 21 in. by 5 1/4 in. gives a ratio of 4:1, which is our sheave ratio. Refer to Table 1; on the 4:1 ratio line, with 5 1/4 in. for

Table 4
(Horsepower rating of round belting.)

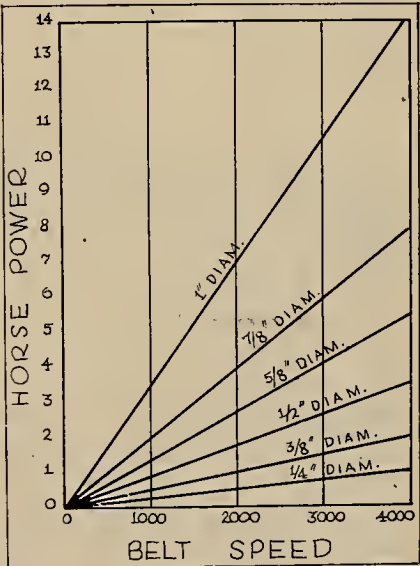
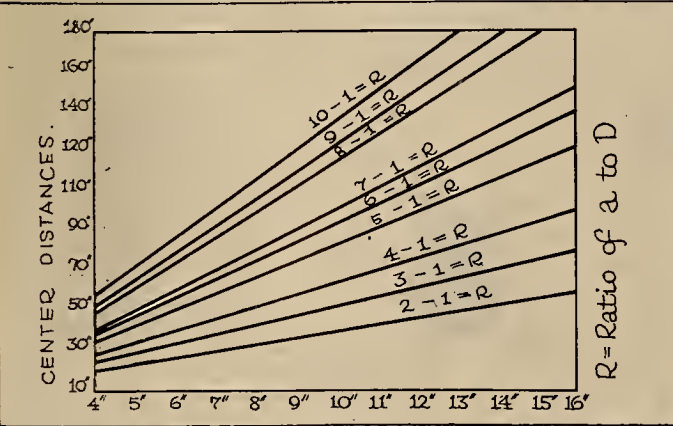
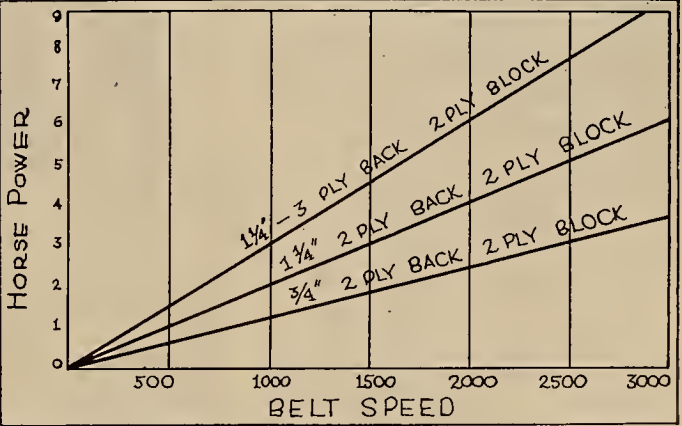


Table 1
(Recommended center distances for block V belting.)



Recommended center distances for various diameters of the smaller sheave and different sheave ratios. Follow vertical line corresponding to diameter of the smaller sheave to its intersection with the ratio in question. Following the horizontal line to the left will give the center distance.

Table 3
(Horsepower rating for block V belting.)



Power transmitting capacity of a V belt is found on the line marked "horsepower" opposite the intersection of the vertical belt speed lines and angular lines representing the size of the belt. Make corrections for arcs of contact of less than 160 deg.

smaller sheave, at left we find 33 in., as the center distance.

Table 4 shows the capacity of round leather belts at various speeds and sizes. For belts up to ½ in. diam. 45 deg. sheaves will prove the most satisfactory. If the belt speed is over 1,500 ft. per min. the groove in the sheave should be deep enough to allow the top of the belt to be at least flush with the top of the sheave, and deeper would be better. Otherwise the belt will have a tendency to jump from the sheave. See Fig. 1.

All round belts are not of the same pliability so the proper type of belt must be chosen for the particular size of sheave over which it is to operate. Table 5 gives the minimum size of sheave for three typical types of round belts.

Table 5
(Minimum diam. of pulleys over which various sizes of round belting may be run successfully.)

Minimum Pulley Diam.			
Diam. of Belt (In.)	Solid Round Belt (In.)	Folded Twist Belt (In.)	Patent Round Belt (In.)
⅛	1½	½	.....
3/16	2	1	.....
¼	2½	1½	.....
5/16	2¾	2	.....
⅜	3	2½	.....
7/16	3¼	3	6½
½	3½	3½	7
5/8	.....	4	9
¾	.....	5	11
7/8	.....	6	14
1	.....	6½	18

—Link Belt Co.

The maximum safe speed at which to operate belts is considered as 5,000 ft. per min. For good practice the following belt reductions should not be exceeded:

1/15	hp. motor	15 to 1.
1	hp. motor	10 to 1.
5	hp. motor	8 to 1.
10	hp. motor	6 to 1.
20	hp. motor	5 to 1.
50	hp. motor	4 to 1.

Calculating pulley sizes and speeds and ratios between pulleys to obtain desired shaft speeds seems to be very difficult for some estimators. The formula used is very simple and does not require a great deal of effort to memorize. If three of the factors are known, the fourth is very easy to calculate. Of the four factors, two are for speeds and two are for diameters. Where only two of the factors are given, the third must be assumed, in order to obtain the fourth.

Any of the four factors may represent the unknown quantity. To illustrate this point, consider the formulas given below:

- Formula 1: $D \times S = d.$

S
- Formula 2: $d \times S = D.$

S
- Formula 3: $D \times S = s.$

d
- Formula 4: $d \times s = S.$

D

Where d, diam. of driven pulley.
Where D, diam. of driving pulley.
Where S, r.p.m. of driving pulley.
Where s, r.p.m. of driven pulley.

To understand the use of the formula let us solve a problem based upon one of the above formulas:
Given: D, 4-in.; S, 1,800; s, 200.
To find: d, diameter of the driven pulley.

Solution: Use formula 1,

$$d = \frac{D \times S}{s}$$
$$d = \frac{4 \times 1,800}{200}$$
$$d = 36\text{-in., diameter of the driven pulley.}$$

By substituting known factors for those assumed above, the formula is applicable to all pulley problems.

Editor's Note: The author is indebted to C. A. Schieren Company for tables and figures used in this article.

Ordinance Requiring Metal Service Passed.—An electrical ordinance requiring an all-metal service has been passed in Compton, Calif.

The Harper Electric Company, Orange, Calif., has been sold to Charles L. Alt. Mr. Alt will conduct the business under the name of the California Electric Company

Advertising of Jobber Advocates a Quality Wiring Job

Quality wiring installations are being advocated by the entire electrical industry through the Red Seal plan of adequate wiring. The wire, switches, and every piece of equipment are included in a quality job.

The accompanying reproduction of a newspaper advertisement of the Graybar Electric Company is tying in with this program in selling a real job. It calls the attention of the public to the fact that the unseen part of an electrical wiring installation is an important consideration when an entirely satisfactory job is wanted. This type of advertising is aiding the contractor who does only quality work.



The "dickey," or shirt that was all front, is a thing of the past. So is the electrical wiring job that just had to look pretty. People want the real goods all the way through.



No "dickey" methods in this wiring job~

WHEN you have your house wired, don't be satisfied with a "dickey" job. Like the shirt with a false front the electrical installation with a false front can't hope to cover your requirements.

Out of sight—but not out of mind

For 100% service out of electric light and power, your electrical contractor

will tell you that the wiring supplies you can't see—behind the walls—are just as important as those you can see.

Graybar backs up your contractor with quality supplies for the whole job.

At our office he can get quick service on quality electrical supplies—the kind that will play a part in your day-by-day satisfaction with the job.



A typical toggle switch. Back of it are all these parts—and they all have to be made right and put together right.



Graybar
ELECTRIC COMPANY

Electrical Supplies
wholesale only

SUCCESSOR TO
SUPPLY DEPT
Western Electric

The necessity of having material of the highest quality for the entire electrical installation was brought to the attention of the public in this newspaper advertisement of the Graybar Electric Company.

Uniform Electrical Ordinance Is Urgent Need

Protects Public and Assures Stability of Administration to Owner, Contractor and Manufacturer

(Contributed)

Since the advent of electricity and its application and up until about twenty years ago electric wiring and devices could be installed in any manner suited to the choice of the owner. The authorities were not interested; the municipal inspector was rare, if he existed at all. There was but one factor which tended to prevent actually hazardous installations—the National Electrical Code—designed primarily for the purpose of protecting fire insurance companies and specifying how various kinds of electrical equipment and accessories should be installed in buildings of various classes.

It was not incumbent upon a builder to observe this code. If he did he could secure a lower insurance rate. If he chose to insure himself, or carry no insurance, the code meant nothing. It had no police power and was merely a commercial arrangement which was satisfactory as far as it went. Its specifications furnished protection to insurance risks and standards which guided the commercial operations of builders and electrical manufacturers.

The Code with Police Power Behind It

As a result of the "Safety First" movement which swept over the country during the first few years of this century, and the enactment of workmen's compensation laws by many states, ordinances were put through in a great number of cities for the purpose of controlling and regulating the installation of electric wiring and devices in buildings within their jurisdiction. These ordinances carried with them the appointment of inspectors to see that the regulations were complied with.

Under these conditions the building owner no longer could make observance of electrical installation regulations a matter of his own choice. Municipal police power now told him what he must do in the interest of public safety.

Although the purpose of these regulations and the spirit behind their enactment are entirely laudable and represent an effort to reduce the loss of life and property by fire, the results, as carried out in practice, are quite unsatisfactory. In place of one recognized code, which had previously guided the builder, contractor, electrical manufacturer, and public utility, a large number of codes came into existence, each varying as to its specifications and each with police power behind it. Politics and the personality of inspectors were given an opportunity to intrude themselves upon the problem, and this they did.

Injury to Public Through Multiplicity of Codes

With a great number of cities each promulgating its own code, even based as they must be on the older National Code of the fire underwriters, a multiplicity of regulations must follow, each with the public safety in view but unavoidably differing in detail. Where a condition such as this holds, the result is confusion and a waste of patience, time, and money.

Serious Effect on Electrical Industry

To realize the effect of this multiplicity of codes on the electrical manufacturer, just call to mind the enormous economy of large-scale production of standardized products. With varying codes, specifying varying details for equipment or devices for the same purpose, a single standard product will not meet requirements. There must be a number of products, almost exactly alike and unnecessarily differing in detail; hence the impossibility of large-scale standardized production. The manufacturer in a case like this passes on the effect of increased production costs to the consumer. In other words, a multiplicity of codes means higher prices.

Further than this, such conditions are a distinct hindrance to progress in development of the electrical industry and tend to raise prices through restricted competition.

Uniform Electrical Ordinance a Simple Remedy

The problem presented by the above conditions would be cleared up by the general adoption of a uniform state statute and municipal ordinance covering the necessary provisions for the administration of adequate specific rules and regulations governing the installation and inspection of electrical equipment.

The Electrical Manufacturers' Council, after careful study of the conditions to be met, in order to obtain this much needed result prepared its Uniform State Statute and the Uniform Electrical Ordinance for the guidance and use of various governmental regulatory bodies.

These documents are short, the scope of the municipal ordinance being indicated by the following section headings:

1. Electrical Inspector.
2. Appointment, Salary and Duties of Electrical Inspector.
3. Right of Access to Building.
4. Permits.
5. Inspection.
6. Re-inspection.
7. Construction Requirements.
8. Records of Permits and Inspections.
9. Review.
10. Penalty.
11. Repeal of Conflicting Ordinances.
12. Enforcement.
13. Responsibility of Owner.

In addition, there is an optional section which provides for the licensing of electricians and may be used when and where deemed advisable.

The Two Codes

Section 7, Construction Requirements, is the heart of the ordinance. This section states that "No certificate of inspection shall be issued unless the electric light, power, and heating installations are in strict conformity with the provisions of this ordinance, the statutes of the state of * * * , the rules and regulations issued by the industrial commission of

* * * * *, under the authority of the state statutes, and unless they are in conformity with the most approved methods of construction for safety to life and property. The regulations as laid down in the National Electrical Code, as approved by the American Engineering Standards Committee, and in the National Electrical Safety Code, as approved by the American Engineering Standards Committee and other installation and safety regulations approved by the American Engineering Standards Committee, shall be prima facie evidence of such most approved methods."

It is to be noticed that this clause has been worded very carefully so that the power of the state or municipality to control its own rules and regulations has not been interfered with, but the regulations as laid down in the codes referred to are made prima facie evidence of the most approved methods and thereby gain the legal and moral support of the states and municipalities. Rules under the codes required by purely local conditions are not prevented.

In explanation of these codes: The National Electrical Code which covers fire protection was drawn up by the Electrical Committee of the National Fire Protection Association and promulgated by the National Board of Fire Underwriters. The National Electric Safety Code, which covers casualty protection, is the work of the Electric Safety Conference and the U. S. Bureau of Standards. Both codes were nationalized, owing to their being prepared in accordance with the procedure necessary to receive the approval of the American Engineering Standards Committee. It is the thought and experience behind these codes and their national character which gives great value to the Uniform Electrical Ordinance and makes it worthy of acceptance by all municipalities.

Favorable consideration is being given to the adoption of this ordinance by many municipalities. Everywhere its presentation is being met with great success, as it conforms to the requirements of governmental bodies and assures stability of administration to the owner, contractor, public utility, and electrical manufacturer by providing for uniform installation methods. The public receives its great benefit in adequate protection to life and property at a minimum cost.

U. S. Court Upholds Resale Price Suggestion by Manufacturer

Manufacturers may suggest a resale price to the dealer and then refuse to sell to dealers who do not maintain the suggested price, according to the gist of a decision of the United States Court in the eighth district. The case was that of the United States v. Richard Hudnut.

Previous decisions of the courts had held that any agreement between the dealer and the manufacturer to maintain a resale price was a violation of the Sherman Anti-trust Act. The attitude of the dealer is the only difference in the two cases. In the latter case the dealer agrees to the resale price and also observes it.



S. B. Goodman's log cabin home on Yosemite Avenue, in a setting of fir trees and mountain shrubbery, is one of the most unique and attractive Red Seal homes in Fresno, Calif.



This new home of Dr. D. H. Trowbridge is complete in electrical equipment. Contrasting this with the modest home on the left, the extreme applications of the Red Seal Plan are evident.

Convenient Testing Arrangement Designed by the Contractor

E. J. Gartley, electrictist of Bakersfield, Calif., has provided a handy layout in his store for testing appliances and small motors.

A drop cord has been equipped with two prongs on one end. The equipment on the shelf above the bench in Fig. 1 consists of a 10-watt lamp, a small transformer, a bell and a 200-watt lamp. The single convenience outlet near the bench supplies 6-volt current with the bell in

outlet is connected directly on the 110-volt circuit.

One circuit protected by one set of fuses is used to supply current to all of the testing equipment. The fuses are placed in a steel can in order to eliminate any danger. If desirable, a layout similar to this also might be supplied with 220-volt power. In his work Mr. Gartley has not found this to be necessary.

Electrictists Display Exhibit Urging All-Metal Code

The members of the California Electrictists at Glendale, Calif., displayed a booth at a merchants' exposition held in that city, in which they had prepared an exhibit designed to show the public the dangers of faulty electrical work. The exhibit was of an educa-

tional nature and advocated an all-metal standard of electrical wiring.

The principal feature of the exhibit, in addition to show cards carrying short sayings advocating a conduit installation, was the display showing defective materials and parts taken from buildings in which they had caused fires.

Literature explaining the benefits accruing from an all-metal standard was distributed to visitors at the exposition. The results of the display have been gratifying as a number of people have asked for an inspection of their residences, and it is also expected it will aid in the passage of an ordinance covering an all-metal standard of electrical wiring to apply in all parts of the city.

This is the section educational exhibit displayed by the Glendale electrictists, the other being a traveling window display.



Convenient arrangement supplying 6 and 110-volt current for testing appliances and small motors.

series with it. The open outlet immediately below this supplies 110-volt current and is used for testing lamps or irons. The left-hand outlet of the duplex group below this supplies current with the ten-watt lamp in series with the appliance; the outlet on the right with the 200-watt lamp in series. The lower duplex convenience



Fig. 1. Exhibit advocating an all-metal standard of electrical wiring which was displayed at a merchants' exposition in Glendale, Calif., by the electrictists of that city.

NEWS OF THE INDUSTRY

Many Papers on Electrification Scheduled for A.S.A.E.

The subject of rural electrification will receive much attention at the annual meeting of the American Society of Agricultural Engineers at Tahoe Tavern, Lake Tahoe, June 23-26.

"Rural Electrification from an Economic and Engineering Standpoint," a paper prepared by L. S. Wing, engineer for the California Farm Bureau Federation, will be presented Thursday morning, June 24.

Other papers on the subject of rural electrification to be included on the program for Thursday morning are: "The Farmer as a manufacturer," by Arthur Huntington, of the Iowa Railway & Light Company, and chairman of the rural electric division of the society; and "The Relation of Power to Agricultural Production and Profits," by C. D. Kinsman, Division of Agricultural Engineering, U.S. Department of Agriculture.

A special rural electric program has been arranged for the evening of Wednesday, June 23. The subjects to be discussed at that meeting are: (1) "Rural Line Characteristics; Improving Load and Diversity Factors," by Franklin J. Zink, assistant engineer, Iowa's Community for Electric Development, and F. D. Paine, assistant director, Committee on the Relation of Electricity to Agriculture; (2) "Poultry Conditions on the Farm as Affected by Electricity," E. A. Stewart, University of Minnesota; (3) "Recent Developments in Electric Brooders," G. W. Kable, Oregon Agricultural College; (4) "Results of Investigations in the Application of Electricity to the Dairy Industry in California," B. D. Moses, University of California.

Anyone interested in the program of the society is being extended a cordial welcome to attend and take part in the discussion. Further information may be secured by writing to L. J. Fletcher, secretary of the Pacific Coast Section, A.S.A.E., Davis, Calif.

Commencement of Lewiston, Ida., Development Announced

The recent letting of a contract for the construction of a power dam, forebay dike, power house and tailrace on the Clearwater River, near Lewiston, Idaho, to Winston Brothers, contractors, Minneapolis, presages early commencement of the joint power and sawmill development at Lewiston. (Journal of Electricity, April 15, 1925, p. 297.) Principals in the development are the Clearwater Timber Company, a Weyerhaeuser company, which will build a mill with a capacity of 200,000,000 ft. annually, and the Inland Power & Light Company, affiliated with the Pacific Power & Light Company and Northwestern Electric Company, Portland, which will develop 10,000 kw. The

work contemplated in the present contract, which was let by the power company, will create a forebay for the power development and a log pond for the sawmill. The contract covers practically the entire power development with the exception of installing the electrical machinery.

The dam is to be a comparatively low diversion dam, 35 ft. high, and about 1,000 ft. long. It will contain a fish ladder and log chute, and 925 ft. of spillway section containing two Taintor gates, three needle beams gates and three roller gates set between piers resting on a concrete base. These gates will control a flow 50 per cent greater than ever has been recorded in the Clearwater River under extreme flood conditions. An earth-fill dike extending about 7,000 ft. parallel to the river and across the flat will then sustain the diverted water in a forebay covering some 400 acres of existing fruit and truck farm land. It will be necessary to re-locate about two miles of Northern Pacific Railway Company tracks along the south side of the forebay where natural hills will form the south shore.

The power house will be located in the dike at the west end of the forebay. Here short steel penstocks will carry the water through two 7,000-hp., S. Morgan Smith water wheels direct-connected to 5,000-kw., Allis-Chalmers generators. The plans allow for a draw-down of the forebay water sufficient to take care of daily peaks. Here likewise is provided a second spillway section for water control, and a tailrace 4,500 ft. in length will be excavated to carry the water back into the Clearwater River. The sawmill will be situated below the forebay on property adjacent to the power house.

An outdoor transforming and switching station will provide the terminus for a 66,000-volt tie line to the Clarkson, Wash., substation of the Pacific Power & Light Company, some three miles distant, from which the Lewiston district is served. This will tie the new plant in with the Yakima-Walla Walla, Wash., power system of that company furnishing a new source of supply on the extreme eastern end of that system. The new power house will be about one mile east of the city limits of Lewiston, and the dam is to be three miles from the confluence of the Clearwater with the Snake River.

Power Company Installs Electric Furnace.—The San Joaquin Light & Power Corporation, Fresno, Calif., is having installed an electric furnace for drill heating at 2,400 deg. F. The furnace, which is being built by James H. Knapp, Los Angeles, will be equipped with Globar heating elements manufactured by the American Resistor Corporation.

Petitions Out for Water and Power Act

Circulation of petitions to have the Water and Power Act placed on the ballot at the November election began last month in a number of California cities. Solicitors with the petitions were in evidence at places which would enable them to catch crowds.

Supporting the Water and Power Act in its third attempt to become a part of the constitution of the state are the same group which has supported the measure in the past two campaigns, namely: Rudolph Spreckels of San Francisco, Dr. John R. Haynes of Los Angeles, William Kent of Kentfield, James D. Phelan and Paul Scharrenberg of San Francisco, and Louis Bartlett of Berkeley. Franklin Hichborn, executive secretary of the California Water and Power Act League, the Spreckels organization for the promotion of the measure, is in charge of the campaign again.

The Water and Power Act twice was defeated overwhelmingly by California voters, the first time in 1922 and again in 1924, each time by over two to one majority. It is understood that the present act has not been changed in any respect from that proposed on the previous two occasions (see Journal of Electricity, May 15, 1926, p. 491), and that the campaign to have it approved by voters will be based upon the same arguments and contentions as of former attempts. In launching the act, Mr. Hichborn reiterated former charges against power companies, made reference to Ontario, and denounced as misrepresentation the efforts of power companies to give the public their arguments against the act.

Long Beach Electrical and Radio Dealers Exhibit at Fair

Almost a score of electrical and radio dealers and manufacturers participated in the sixth annual Harbor Industrial Exposition, Auto and Radio Show which recently was held in the Municipal Auditorium at Long Beach, Calif. The display included many electrical appliances, such as refrigerators, washing machines, vacuum cleaners, ironers, and other household devices, and many of the booths staged demonstrations. The Southern California Edison Company had an attractive booth where hot biscuits, baked on electric appliances, were served to visitors. This exhibit received a certificate of award.

In the radio section nine exhibitors had displays. A silver cup for the best exhibit in that section was awarded The Belmont Radio Studio, and silver medals for special merit to the F. O. Lantz Company and the McCrery Music Company.

The exposition was well attended.

Puget Sound Company Women Form Association

Organization of the Women's Cooperative Association of the Puget Sound Power & Light Company in Seattle, with seventy charter members, has been announced by Miss Nelle Duffy, permanent chairman. Miss Nina L. Carson was elected secretary. The first meeting was held in the Hotel Gowman, at which R. M. Boykin, manager of the Seattle district, and Col. H. C. Winsor, personnel officer, were guests. W. D. Shannon, engineer in charge of constructing the new Baker River development, made an address illustrated with lantern slides.

Objects of the new organization are declared to be: to provide better opportunity for advancement of women employees and prepare them for greater responsibilities; to educate members in public speaking and to provide opportunities for vocational education as a means of advancement.

Customer-Ownership Program Is Continued by Utility

After disposing of 15,000 shares of its new 6½ per cent cumulative preferred stock in twenty-three days (Journal of Electricity, May 15, 1926, p. 493), The Washington Water Power Company, Spokane, authorized an additional allotment of 15,000 shares of the same stock in order to continue its customer-ownership program.

The stock is being sold at its par value of \$100. The company opened its subscription books on April 7 and acquired approximately 1,300 new stockholders through its efforts during April. The experience of The Washington Water Power Company in offering its first preferred stock has broken previous sales records of utility stocks in eastern Washington. The company has increased its capitalization to \$40,000,000 in order to issue the preferred stock.

Declares Refrigerator Mergers Solely for Economy

Explaining the purposes behind the merger of several electric refrigerator companies, Arnold H. Goss, president of the Electric Refrigeration Corporation, which was formed last year as a merger of the Kelvinator, Nizer and Grand Rapids refrigerator corporations, declared that he welcomed investigation. He said:

"The motive behind our merger was not an endeavor to eliminate or reduce competition, nor an endeavor to evade anti-trust laws, but solely for the purpose of gaining economy of operation through the co-ordination of competent divisions participating in all branches of the electrical refrigeration industry."

Prizes for Merchandising Methods Offered by E. N. Hurley

An offer of \$10,000 to be distributed in three prizes to the electric light and power companies that during 1926 make the most constructive contribution toward developing a more effective method of merchandising electrical household appliances was received from E. N. Hurley, president of the Electric Household Utilities Corporation, Chicago, during the N.E.L.A. convention at Atlantic City, May 17-21. The amount is to be divided as follows:

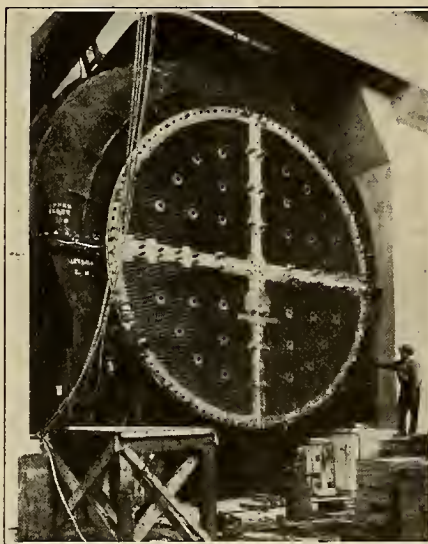
first prize \$5,000, second prize \$3,000, and third \$2,000.

The offer was accepted on behalf of the National Electric Light Association by E. W. Lloyd, Commonwealth Edison Company, Chicago, chairman of the Commercial National Section.

San Francisco Manufacturing Companies Consolidate

The Stewart Electrical Manufacturing Company and the Electrical Sheet Metal Works, both of San Francisco, have consolidated with the Frank Adam Electric Company of that city. The new company will be known as The Stewart Works of the Frank Adam Electric Company. It will manufacture and sell FA panel boards and Stewart safety-type dead-front switchboards for distribution on the Pacific Coast. For the present the Electrical Sheet Metal Works will remain at 81 Shipley Street and the Stewart panel board works at 59 Columbia Square.

The personnel of the new company is as follows: manager—J. T. Stewart, sales manager—Edward Lang, sales engineers—Lee Van Atta and Frank Rivers; superintendent—R. E. Grimes.



A 75,000-sq.-ft. condenser in process of installation at the Long Beach plant of the Southern California Edison Company. It is designed to pass cooling water at the rate of 100,000 gal. per min. and to condense 600,000 lb. of steam per hour. More than 50 miles of 1-in. tubing provides the cooling surface.

Gates Closed and Storage Begun at Exchequer Dam

The Exchequer Dam of the Merced Irrigation District's irrigation and power project on the Merced River in California is finished; the gates have been closed and storage has begun in the reservoir, which has a capacity of 280,000 acre-ft. (Journal of Electricity, Dec. 15, 1925, p. 467.)

On May 4 the total head of water behind the dam was 190 ft., with a total storage of 64,000 acre-ft. By that time all the machinery had been assembled in the power house and the plant was scheduled to be ready for regular service by June 1. The finishing touches on the construction work are to be done and all the construction equipment removed by about the middle of July.

Cancel Water Rights on Campbell River, Vancouver Island

The Water Board of the Department of Lands of the Province of British Columbia has terminated the license giving water rights on the Campbell River on Vancouver Island to the Campbell River Power Company, because the company, which has held the license for 16 years, has done nothing toward developing the water power. The board further has reserved the power rights and will not grant a license again until some company or individual presents a plan of development and undertakes to develop and utilize the power. The action of the board can be appealed before the Appeal Court of British Columbia.

During the period that it has held the license the Campbell River company claims to have spent \$200,000 in gaging the water, government fees, surveys, plans, traveling and office expenses. It has not developed the power because it desired first to be assured of customers for the use of the power, and these it has been unable to find.

According to the Dominion Water Powers Department, 150,000 hp. can be developed at a low cost on the Campbell River. It is rumored that the Consolidated Mining & Smelting Company of Canada, which owns extensive mineral property on Vancouver Island, and which, through its subsidiary, the West Kootenay Power & Light Company, already has developed 72,000 hp. at Bonnington Falls, near Nelson, B.C., is desirous of acquiring the water rights of the Campbell River, but this rumor has not been confirmed.

Applications for Water Permits Filed in Oregon

Recent applications for permits to appropriate water from Oregon streams, filed at the office of Rhea Luper, state engineer, Salem, include two for power purposes. Carl F. Uhden, Ernest B. Hussey, James B. Dodge and Kenneth G. Harlan, all of Seattle, have applied for permission to appropriate water from Walla Walla River and to construct the Bear reservoir and Elbow reservoir to store approximately 40,000 acre-ft. for irrigation and power purposes in Umatilla County.

The city of Eugene, Ore., has filed for the purpose of constructing the Bear Creek reservoir in Lane County for the storage of 30,000 acre-ft. of water from the McKenzie River and Johnson Creek, appropriating 5,200 sec.-ft. of water from this storage for the development of 71,363 theoretical horsepower at an approximate cost of \$4,281,780.

Tacoma Light Department to Furnish Light and Power to Peninsula District.—The Tacoma City Light Department has entered into an agreement with the Peninsula Light Company, organized by residents of the peninsula district of Pierce County, as a mutual corporation to distribute light and power, whereby the light department will finance the construction of a transformer station for the suburban district and be safeguarded against loss in case anything occurs to interfere with the city furnishing the mutual company power. The station will cost about \$22,000.

Edison Company Awards Cups to Two Districts in Contest

Marking the close of the second year of competition for the Charles A. Coffin Foundation Cups between the thirty-one geographical districts comprising the territorial divisions of the Southern California Edison Company, the Santa Paula district was awarded the Commercial Cup for being the premier district in the commercial department for the year 1925, while the Fullerton district was awarded the Operating Cup for being the leading district in the operating department.

The commercial department cup is awarded to that district which has shown the highest degree of development in general efficiency and co-operation, collections, sales, public relations, appearance of company's property, and sale of company's junior securities.

The operating department cup is awarded to that district which has shown the greatest efficiency in the following six major operating factors: Construction efficiency, operating and maintenance expense, accounting accuracy and experience, district store operations, labor conditions, and accidents.

R. H. Ballard, executive vice-president and general manager, awarded the cups to C. B. Hutchinson, district manager of the Fullerton district, and L. S. Lothridge, district manager of the Santa Paula district, who received them for their respective districts.

Organization Formed to Aid Institute of Technology

Great encouragement has been given to the faculty of the California Institute of Technology, and a substantial support for its work has been provided by the recent organization of 100 men and women of southern California, who will be known as the California Institute Associates. At a meeting held in the home of Henry E. Huntington recently Russell H. Ballard, vice-president and general manager, Southern California Edison Company, was elected president of this new group, which is being established for the purpose of furthering the research and educational enterprises of the Institute.

The California Institute of Technology is one of the few schools in America requiring a five-year course. Its student body is limited to 500 with liberal provision for graduate work. Outstanding features of the institution are the Gates Chemical Laboratory and the Norman Bridge Laboratory of Physics, given by the two men whose names they bear, and the high-voltage laboratory for the study of electrical engineering provided through the generosity of the Southern California Edison Company.

The new organization of California Institute Associates will supplement the liberal endowments previously made and will make possible an increase in the number of research workers and the necessary additions to laboratory equipment which they will need. Besides Mr. Ballard, the president, the names of many men well known to the electrical indus-

try are found on the list of memberships, including Henry E. Huntington, John B. Miller, William G. Kerckhoff, Harry J. Bauer, Allen C. Balch, Harry Chandler, Henry M. Robinson, Herbert Fleishhacker, Arthur H. Fleming, Fred B. Lewis, Dr. Millikan, Alan E. Morphy and A. N. Kemp.

Dealers Urged to Get In June Bride Campaign

It is estimated that there will be 20,000 weddings in California during June, and that the average number of gifts given to brides is five. Consider also that this is the slow-moving time for electrical appliances, as a rule, and the combination, according to the California Electrical Bureau, provides electrical dealers with an opportunity.

The bureau is making an extensive advertising campaign in the newspapers of the state to foster the idea of giving electrical gifts to June brides. Attractive posters for window displays are available to dealers from the bureau without cost. And to stimulate competition in the June bride activity \$125 in prizes is to be given by the bureau for the best window displays carrying out the idea.

The electrical dealer has an unusual opportunity to convert the usual June slump into a profitable season for appliances, according to the bureau.

Tacoma Settles for Construction of Cushman Power Project

Settlement of all claims of A. Guthrie & Company, contractors for the construction of the Cushman Power project for the city of Tacoma, Wash., has been made with a final check of \$231,178.47 by the city council. The payment to the Guthrie company closed the contract for the construction of the dam and appurtenant works, the power house substructure and the power house superstructure.

The cost of this project is sufficiently within the original estimate to allow the construction of the spillway and the homes for operators at the power house without running over the figure set, notwithstanding the half million dollars spent in making the project better than originally planned, Ira S. Davisson, commissioner of light and water, states.

The total cost of the Cushman project will run around \$5,250,000, it now is indicated. An issue of \$4,000,000 bonds was authorized for the project and the remainder will be borne out of the current net earnings of the light department.

Puget Sound Company Buys Lake Rutledge Company.—The Puget Sound Power & Light Company recently purchased the Lake Rutledge Electric Light Company serving the Long Lake and Hicks Lake districts in the vicinity of Olympia, Wash. The trunk line purchased is one and a half miles long and will be extended immediately.

Sales Department Reorganization Announced by Graybar

A reorganization of the sales department of the Graybar Electric Company, recently announced by G. E. Cullinan, vice-president in charge of sales, effects the following changes in personnel in that department: M. A. Curran, assistant to vice-president, formerly manager of the central station department; J. L. Ray, general supply sales manager, formerly manager of supply and equipment department; E. A. Hawkins, general telephone and appliance sales manager; G. F. Hessler, general utilities sales manager, formerly manager line material sales department; G. K. Heyer, assistant general supply sales manager, formerly telephone sales manager; A. J. Eaves, public address and carrier current sales manager; P. M. Rainey, telephone sales manager, formerly sales development manager; G. E. Chase, broadcasting sales manager, formerly broadcasting sales engineer; O. E. Richardson, broadcasting sales engineer; J. W. Skinkle, signaling sales manager; A. E. Hetzner, signaling sales engineer; and A. S. Wise, appliance sales engineer.

These changes in staff personnel will result, according to Mr. Cullinan, in a more specialized organization, necessitated by the great growth of the electrical industry as a whole and more particularly by the expanding activities of the Graybar company.

Grand Forks, B. C., to Construct 1,200-hp. Hydro Plant

The municipality of Grand Forks, B. C., has acquired Smelter Lake and dam from the Granby Consolidated Mining, Smelting, Power Company and will erect a 1,200-hp. hydroelectric plant and an irrigation system. The power will be more than ample for present needs, and the surplus and the irrigation system will be used to attract industrial concerns to locate at Grand Forks and fruit growers to settle in the surrounding country.

The Granby company at one time had a smelter at Grand Forks, but this was closed after the establishment of a smelting plant at Anyox, B. C. The company no longer had use for the dam, which cost more \$100,000 to construct, so returned the property comprising a lake of 800 acres to the town, which originally donated it to the company in consideration for the company's erecting a smelter at Grand Forks.

Westinghouse Lamp Company Elects New Vice-President.—At a meeting of the board of directors of the Westinghouse Lamp Company held recently at its headquarters at 150 Broadway, New York, Arthur E. Allen was elected a vice-president and a member of the board of directors to succeed the late T. G. Whaling. Mr. Allen was general manager of the Westinghouse Lamp Company. Although he has been with the Westinghouse Lamp Company but a short time, having been appointed general manager in April, 1925, Mr. Allen has a long record of progress with the Westinghouse Electric & Manufacturing Company.

Westinghouse Sales Department Completely Reorganized

A complete reorganization of the sales department of the Westinghouse Electric & Manufacturing Company, involving the reallocating of the managing personnel and the creating of several new activities has been announced by E. D. Kilburn, vice-president and general sales manager.

The change, which involves all departmental sales managers of the company, consists of the following appointments: assistant to vice-president—E. H. Sniffin, formerly manager power department; director of sales—T. J. Pace, formerly manager supply department; central station manager—G. H. Froebel, formerly manager marine department; industrial sales manager—J. M. Curtin, formerly manager industrial department; transportation sales manager—M. B. Lambert, formerly manager railway department; assistant director of sales—A. C. Streamer, formerly assistant to manager of supply department; generating apparatus manager—H. W. Smith, formerly general engineer; traction apparatus manager—A. J. Manson, formerly manager heavy traction division, railway department; motor apparatus manager—O. F. Stroman, formerly assistant to manager of industrial department; switch-gear apparatus manager—R. A. Neal, formerly head of switch section, supply department; and distribution apparatus manager—G. A. Sawin, formerly assistant to manager of supply department.

The announcement is the culmination of a reorganization of the Westinghouse sales system which has been in course of development for some time. Its effect, according to Mr. Kilburn, will be to form a more flexible organization now necessary to serve and anticipate the needs of electrical apparatus users, due to the tremendous development of the industry.

Changes in Personnel Announced by Edison Company

The following changes in the personnel of the commercial department of the Southern California Edison Company, Los Angeles, have been announced by W. L. Frost, general commercial manager: W. C. McWhinney has been made assistant general commercial manager. A. W. Childs, who has been general sales manager, has been appointed manager of new business. R. I. Carruthers, who has been assistant general sales manager, has been made manager merchandising department. H. C. Rice has been changed from appliance sales agent to assistant manager merchandise department. P. V. Moffat has been made credit manager.

Grays Harbor County Grants Two Franchises to Utility

The Puget Sound Power & Light Company recently secured two franchises from the Grays Harbor County commissioners at Hoquiam, Wash., each for 50 years. One is for running light and power lines on the Wenzell Road near Elma, and the other for additional service in Woodlawn Addition in Hoquiam.

The company has applied to the Lewis County commissioners for a franchise to construct a power line in the Hannaford Valley to serve several coal mines and 17 farms, and for a 50-year franchise for a power line to be built along Ocean Beach Highway from Chehalis River bridge into the town of Walville, a distance of 19.5 miles, thence across Pacific County to the town of Lebam, a distance of 10.8 miles.

Washington Utility's Crews Busy on Transmission Lines

Four crews are now building transmission lines for The Washington Water Power Company. The new 110-kv. line from near Fairfield, south of Spokane, to the Coeur d'Alene mining district of the Idaho panhandle, will be completed in the late summer. A section of this new line now is being operated at 60-kv. from Wallace to Kellogg. The line is designed to replace two pioneer lines in that district which are operated at 60 kv. The double-pole type of construction is being used by the company and extra heavy construction features are necessary in the mountainous district.

About nine miles of the transmission line between Coulee City, on the general Washington Water Power system, and the Chelan and Okanogan Valley district now has been rebuilt. Due to fog from the Columbia River rising to a higher altitude there and congealing on the wires, the company has had some difficulty in the past with this line. A two-pole type of construction with the wires level is expected to eliminate this. The line now is operated at 60 kv. but will be raised to 110 kv. when the Chelan power project is completed. It now is insulated for 110 kv. for 36 miles.

Feeder Line into Oxnard Being Built by Edison Company

Construction of a new 15,000-volt feeder line into Oxnard by the Southern California Edison Company was begun Feb. 2. This line will tap the 15,000-volt Simi line at what is known as Del Norte corner, and will be a wood-pole line about ten miles long. It will provide insurance against interruption of service and also for possible growth of the community.

At present the Southern California Edison Company has but one 15,000-volt line into Oxnard. This line is adequate to carry the load at present, but should service be interrupted by accident or storm there is no alternative feeder line. This condition is to be corrected by the building of the new line.

While the new line will carry 15,000 volts when completed, which will be in about two months, it is contemplated to increase capacity to 60,000 volts within a short time.

Utilities Establish Joint Headquarters in Denver.—Headquarters for the Arkansas Valley Electric Company, Gilpin County Light & Power Company, and Hinsdale Mining & Development Company have been established in the Western Securities Building in Denver under the management of the Stearns interests. A number of smaller cities in the mountains of Colorado are served by these central stations.

Nevada-California Corporation Holds Annual Meeting

At the annual meeting of the stockholders of the Nevada-California Electric Corporation held recently in Denver the following directors, who had served the company during the past year, were re-elected: Delos A. Chapell, D. H. Coover, George E. Cranmer, S. Nelson Hicks, Edwin S. Kassler, W. E. Porter, Lawrence C. Phipps, Jr., M. D. Thatcher and Arthur B. West.

At the reorganization meeting of the board the following officers were re-elected: president—Edwin S. Kassler, Denver; vice-president—Arthur B. West, Riverside, Calif.; vice-president and treasurer—Lawrence C. Phipps, Jr.; secretary—W. S. Fisher; comptroller—W. C. Simmons, all of Denver. Charles F. Potter is counsel for the company, and Dudley W. Strickland attorney.

A special meeting of the stockholders unanimously voted to increase the authorized common stock from \$20,000,000 to \$50,000,000 and the authorized preferred stock from \$10,000,000 to \$50,000,000.

Two New Power Projects Planned in State of Washington

Two new power projects are being planned in Washington, according to recent applications filed with R. K. Tiffany, state supervisor of hydraulics, Olympia.

One seeking an appropriation of 300 sec.ft. of water from the Klickitat River, a tributary of the Columbia River, was filed by the North Dalles Irrigation District of Portland, Ore., which plans a \$250,000 power and irrigation project developing approximately 2,400 hp.

The other, filed by L. W. Johnson of Tacoma, asks for an appropriation of 700 sec.ft. of water from the North Fork of the Snoqualmie River for the development of 33,000 hp. under a 500-ft. head. The cost of the project, which will be situated in the eastern section of Snohomish County, is estimated at \$2,000,000.

Construction of Third Unit of Bonnington Falls Plant Started.—The West Kootenay Power & Light Company has started on the construction of a third 20,000-hp. unit to its plant at Lower Bonnington Falls, B. C. It is expected that the unit will be put into operation early in the fall. The company is a subsidiary of the Consolidated Mining & Smelting Company of Canada, and the additional power is required to meet the growing requirements of the Trail smelter.

A. I. E. E. News

Seattle Section Elects Chairman.—C. E. Mong, engineer with the Pacific Telephone & Telegraph Company, Seattle, has been elected chairman of the A.I.E.E., Seattle Section, succeeding Prof. Edgar A. Loew. C. R. Wallis of the General Electric Company was named secretary, succeeding Mr. Mong.

News Briefs

B.C. Electric Company to Supply Power for Railway Electrification.—Plans are well under way for the electrification of the Canadian Pacific Railway through the mountains from the Pacific Coast to Calgary, according to recent news dispatches. The British Columbia Electric Railway Company, Ltd., is planning the system that will be used, it is stated.

Big Transformer Shipped to Stanford University.—Shipment of a transformer with a rating of 2,000,000 volts has been made by the General Electric Company to Stanford University, Palo Alto, California. It occupied five freight cars and is valued at \$500,000. The transformer will be part of the equipment in the high-voltage laboratory presided over by Prof. Harris J. Ryan, head of the department of electrical engineering at the university.

Southern Colorado Power Company Completes Interconnection Between Plants in Canon City and Pueblo, Colo.—Complete interconnection of the power plants in Canon City and Pueblo, Colo., was completed by the Southern Colorado Power Company recently. According to E. F. Stone, assistant general manager of the company, the 60,000-volt transmission line was installed at a cost of \$225,000. Power service of the entire Arkansas Valley of Colorado is obtained from these two steam generating plants and a smaller hydro plant at Skagway.

Portland Company Files for Water on Clackamas River.—Recently applying at the office of Rhea Luper, state engineer, Salem, Ore., for permit to appropriate water from the Clackamas River, Clackamas County, the Portland Electric Power Company, Portland, is laying the foundation for further development in the future of its Oak Grove project, the first unit of which was completed in 1924. The present filing, it is stated, is for the purpose of extending existing water rights formerly acquired at a certain point on the river.

California Railroad Commission to Investigate Electrical Service Rates.—The California Railroad Commission has instituted an investigation on its own motion to determine whether the rates and charges of Pacific Gas and Electric Company for electrical service are unjust and unreasonable and to determine the just, reasonable and sufficient rates and charges for that utility. The matter has been set for hearing before Commissioner Clyde L. Seavey in the court room of the Commission at 10 a.m. on May 5, 1926, at San Francisco. The Commission also has been requested by the city officials of Oakland, Berkeley, Alameda and San Francisco to investigate the rates of both the Pacific Gas and Electric Company and the Great Western Power Company of California for domestic service in those communities.

Pe Ell, Wash., Grants 50-Year Electric Light and Power Franchise.—The city council of Pe Ell, Wash., has granted a 50-year light and power franchise to the Puget Sound Power & Light Company. The Pe Ell system will be rebuilt and improvements costing \$10,000 will be made.

Condemnation Proceedings Instituted by Utah Company.—The Utah Power & Light Company has started condemnation proceedings in the federal court against approximately 1,000 acres of land in Cache Valley, Utah, adjacent to the Bear River and its tributaries, the Little Bear and Logan Rivers. It is contended that the land will be inundated in the construction of the reservoir which is an adjunct to the company's new Cutler plant, now in process of construction.

Lumber Company Contracts for Power-House Equipment.—The McCormick Lumber Company, Seattle, recently has signed contracts with the Seattle branch of the General Electric Company for a 1,500-kw. steam turbo-generator set, switchboard and miscellaneous power-house equipment for its proposed mill now under construction at Port Gamble. This order duplicates the purchase recently made by the company for its lumber mill at Port Ludlow.

Power Company Extends Lines Into Farming District.—The Pacific Power & Light Company will make a 5-mile extension of its power lines from Benton City, Wash., into the Benton Highlands district to serve fifty-four ranches.

Permit Granted Puget Sound Utility for Water Storage.—A permit authorizing the Puget Sound Power & Light Company to store 140,000 acre-ft. of water in Lake Shannon for use in connection with the Baker River development of the company, has been issued by R. K. Tiffany, state supervisor of hydraulics at Olympia, Wash. The construction costs are estimated at \$100,000.

Additional Details of Hydraulic Equipment for Melones Plant.—Hydraulic equipment for the Melones plant on the Stanislaus River purchased by the Pacific Gas and Electric Company from the S. Morgan Smith Company will include two 17,500-hp. vertical reaction turbines to operate under heads varying from 120 to 220 ft. The turbines will operate at 277 r.p.m. They will be equipped with "Tru-Spiral" plate steel scroll cases and will be supplied with relief valves of sufficient capacity to discharge 100 per cent of the water passing through the penstock.

Northwest Electric Light & Power Association

Spokane Convention to Be Gala Event of Active Year

Preliminary announcement by J. E. Royer, assistant general manager, The Washington Water Power Company, Spokane, general chairman of the convention committee, indicates that both national and regional features will be incorporated in the program of the annual convention of the Northwest Electric Light & Power Association to be held at the Davenport Hotel, Spokane, June 14-17, 1926. Among the officers of the N.E.L.A. who will be present are James E. Davidson, president; R. F. Pack, first vice-president; M. H. Aylesworth, managing director, and Isabell Davie, national secretary of the women's committees. Earl W. Hodges, of Henry L. Doherty & Company, New York, also has promised to attend.

The program will include also the following from the Northwest: D. L. Huntington, president; J. B. Fiskien, consulting engineer, and W. H. Ude, director of public relations, The Washington Water Power Company; Franklin T. Griffith, president, and A. J. Johnstone, auditor, Portland Electric Power Company, Portland; P. M. Parry, commercial manager, Utah Power & Light Company, Salt Lake; J. G. Hawkins, assistant secretary and assistant treasurer, and L. H. Kistler, superintendent meter department, Northwestern Electric Company, Portland; L. A. McArthur, vice-president and general manager, Pacific Power & Light Company, and Mrs. L. A. Mc-

Arthur, Portland, as well as many others who will be announced definitely later.

The program proper is designed to eliminate conflicting parallel sessions and entertainment features. Three days are given over to a series of general sessions for business, and the fourth day largely to entertainment. The Monday morning session will be opened by Charles A. Flemming, mayor of Spokane, in an address of welcome to which Mr. Huntington will respond. Mr. Davidson is scheduled for this session as is also the annual address of the president, Lewis A. Lewis, sales manager, The Washington Water Power Company. Succeeding general sessions will be conducted by the various sections as follows: Monday afternoon, Commercial Section; Tuesday morning, Technical Section; Tuesday afternoon, Public Relations Section; Wednesday morning, Accounting Section; and Wednesday afternoon, Women's Committee of the Public Relations Section. Election of officers likewise will be Wednesday afternoon.

The annual golf tournament for the Kilowatt Cup will take place Thursday at the Hayden Lake course, whither the convention will be moved for golf, swimming and other recreation. Other entertainment features include the president's reception Monday evening, a dancing and swimming party Tuesday evening, a dinner dance and program Wednesday evening, besides special plans for the entertainment of the ladies during the three business days of the convention.



News of the Electragists



California Electragists Discuss Work at Sacramento Meeting

Constructive work being done by each division and the progress of the Red Seal plan were the major topics of discussion at the quarterly meeting of the California Electragists, Northern Division, which was held at the Hotel Senator, Sacramento, on May 21.

The executive committee meeting was held at 10:30 a.m. Plans for the state-wide meeting of the California Electragists to be held at the Hotel Del Monte, Del Monte, Oct. 1-3, were discussed. It was decided that Oct. 1 and 2 would be devoted to business with a meeting each morning and afternoon. The evenings and Sunday will be devoted to entertainment. It was suggested that a number of group meetings be held dealing with particular problems such as merchandising, estimating, and motors.

The general open meeting was held at 2 p.m. with C. Felix Butte, vice-president, in the chair. After the report of the executive committee was made he stressed the importance of the state-wide meeting to be held at Del Monte and urged all members to attend.

Progress of the Red Seal plan in California was discussed by Victor W. Hartley, executive secretary of the California Electrical Bureau. He called attention to the value of the plan in raising the general standards of electrical construction. Mr. Hartley stated that 146 Red Seal homes had been built in California during the first three months the plan had been in operation, with an average increase of fifty per cent in the amount of wiring installed. In speaking of the Red Seal home displayed in Sacramento during Better Homes Week he stated it was the first home to be sold, evidencing the sales value of a Red Seal home to the realtors and the building industry. Mr. Hartley stressed the need

of a spirit of co-operation between all branches of the electrical industry.

The use of pictures in selling and advertising, as well as in educational work, was discussed by Rollin Smith of the Rollin Smith Engineering Company.

George Eldridge, field representative of the Northern Division of the California Electragists, outlined the work which has been done by the division.

C. J. Geisbush, executive secretary of the Southern Division, gave a very interesting talk on the constructive work which has been done by that division. He stated the credit men of the electrical supply jobbers have been co-operating with the association in its efforts to have electragists install adequate accounting systems. The work of the estimating section in presenting the electragist method of estimating to the members was explained. In discussing the merchandising section Mr. Geisbush stated contact first was made with the power companies and the jobbers; following this the first merchandising institute was held. This consisted of a series of group meetings which were addressed by men selected by the jobbers to tell the story of the sale of electric ranges, proper window display and store arrangement. This was a method of taking the work of the committee to the members.

The June Bride campaign was outlined by Mr. Hartley.

Sixty-five members from the San Francisco Bay territory made the trip to Sacramento aboard the steamer Navajo, leaving San Francisco Thursday night and returning Friday night.

Paul H. Needham, who has conducted his contracting business in Beverly Hills from an office for a number of years past, has opened a new store at 116 Speedway Drive, Beverly Hills.

Contractors' Association Dinner Sponsored by President

Matt Whitney, newly elected president of the Colorado-Wyoming Electrical Contractors and Dealers Association, recently sponsored a dinner meeting in Colorado Springs. The meeting was attended by contractors, executives of the municipal light department and city officials. The purpose of the meeting was to encourage closer co-operation within the industry.

The Red Seal plan was discussed and considerable interest was manifested in it. This activity will be developed as soon as wiring rules and inspections have been perfected.

Southern California Electragists to Meet in San Diego June 26

The next quarterly convention of the California Electragists, Southern Division, will be held at the Hotel San Diego, San Diego, on Saturday, June 26.

Delegates from the immediate vicinity of Los Angeles will leave Los Angeles Harbor Friday, June 25, at 6 p.m. aboard the Ruth Alexander, arriving in San Diego Saturday morning about 8 o'clock.

Regular sessions of the convention will be held in the sun room of the Hotel San Diego all day. By arrangement with the Pacific Steamship Company it will not be necessary to leave the hotel until 11:30 p.m. Saturday.

California Electragists to Hold State-Wide Meeting in October.—Announcement has been made that the annual state-wide meeting of the California Electragists will be held at the Hotel Del Monte, Del Monte, Oct. 1-3. Details of the convention will be announced in future issues of the Journal.

The Exeter Electric Company, Exeter, ran the first Red Seal advertisement in California.

Arthur L. Smith of Seattle has been appointed electrical inspector for the department of labor and industries at Olympia, Wash.

Charles L. Atherton is the proprietor of a new electric store opened at 3713 Sunset Boulevard, Los Angeles. In addition to contracting a complete line of appliances and fixtures will be stocked. Mr. Atherton formerly was with the California Electric Company of that city.

Officers of the Colorado-Wyoming Electrical Contractors and Dealers Association formed at the state-wide meeting of electrical men in Denver, Colo., in March



President—Matt Whitney, Colorado Springs.



Vice-president—W. A. J. Guscott, Denver.



Secretary-treasurer—P. Harry Byrne, Denver.

Meetings

B.C. Electric League Finishes Extraordinary Year

In making its annual report recently the Electrical Service League of British Columbia, with headquarters in Vancouver, revealed a year of constructive activity in the promotion of electrical development in its territory which should place it in leading position with respect to electrical leagues. For 1926, after a year of varied activities, the league intends to concentrate upon the Red Seal home idea, according to George Kidd, president of the league. This announcement was made at the recent annual dinner and rally, at which the report of the past year was reviewed.

During the year the work of the league has been devoted to continuation of the convenience outlet and better wiring campaign; a campaign for the improvement of lighting in the stores of Vancouver and vicinity and concentration on the improvement of factory lighting, as well as a very successful home-lighting essay contest in conjunction with the allied electrical industries of the continent.

Improved lighting systems were installed in new homes, apartments houses, churches, garages, bowling greens, gymnasiums, business offices and schools.

That there is a large field in Vancouver for better store lighting was indicated by the results obtained from circulars sent out by the league, which, without any follow-up, obtained 85 requests to revise the lighting in old stores. Those contractor-dealers who followed up the circulars obtained excellent results.

The factory lighting campaign also yielded excellent results. The replies from 300 prospects selected last October indicated such an interest in better lighting that R. Hall, of the B.C. Electric light and power staff, was loaned to the league as field man. Calling on 210 of the selected list, he succeeded in selling new lighting, reflectors or wiring in 65 plants, and, in addition, sold the idea of better lighting to 34 plants which are carrying out the league's recommendations at the present time. This made a total of 99 plants out of the 210, or practically 50 per cent, in which improved lighting systems were installed.

Another important field of new business in lamps and electric load was found in electric signs, which numbered 100 new installations during 1925, with an initial lamp installation of 14,688, which, renewed every 12 months, makes a total of approximately 29,000 lamps, valued at \$10,000.

The officers of the Electrical Service League this year are: George Kidd, president; W. G. Murrin, vice-president; advisory council—E. E. Walker, chairman; John R. Read, treasurer; J. Lightbody, secretary; J. F. Little, George Wright, J. H. Willard, George Horsman; S. E. Jarvis, P. F. Letts, A. P. Kerley. J. Hart is the secretary-manager.

Clark Baker Named Head of Bay Cities Chapter I.E.S.

Annual election of officers for the San Francisco Bay Cities chapter of the Illuminating Engineering Society recently resulted in the selection of Clark Baker, Sr., as chairman of the chapter for the new fiscal year. Mr. Baker, assistant manager of the National Lamp Works of the General Electric Company, Oakland, Calif., and widely known for his activities in lighting development, lighting schools and for work on the lighting committee of the Commercial Section, P.C.E.A., was elected by popular acclaim. He succeeds Sam P. Russell, partner of H. B. Squires in the firm of that name, who closed a successful year's administration.

Other officers named were: Harry C. Barnard, Curtis Lighting Company of California, vice-chairman; C. D. Monteth, Pacific Gas and Electric Company, secretary-treasurer; board of managers: S. P. Russell; W. F. Hanbridge, Pacific Gas and Electric Company; Louis F. Leurey, consulting engineer; Leo Gianini, Edison Lamp Works, and George Rucker, Holophane Company.

COMING EVENTS

California Electragists, Southern Division—
Quarterly Convention

Hotel San Diego, San Diego, Calif.
June 26, 1926

Northwest Electric Light and Power Association—

Annual Convention—Spokane, Wash.
June 14-17, 1926

American Society of Agricultural Engineers—

Annual Convention—Tahoe Tavern,
Lake Tahoe, Calif.
June 23-26, 1926

American Institute of Electrical Engineers—

Convention—White Sulphur Springs, W. Va.
June 21-25, 1926

American Institute Electrical Engineers—

Pacific Coast Convention, Salt Lake City, Utah
Sept. 7-10, 1926

California Electragists—

Annual State-wide Meeting—Hotel Del Monte
Del Monte, Calif.
Oct. 1-3, 1926

Electrical Representatives of Sacramento Have Meeting

Representatives of all electrical interests and industries in the region of Sacramento, Calif., met recently at the Hotel Senator for a banquet and discussion meeting. In the more than 100 present were representatives from both power companies serving the territory, the telephone company, labor unions, architects, contractors and dealers, and manufacturers' representatives. The meeting was held to co-ordinate efforts and create enthusiasm for June Bride Week, the Red Seal plan and related problems of wiring.

The meeting proved to be an enthusiastic one, and good results are claimed for it along the lines of getting expressions of co-operation from architects regarding the proper specifications for wiring convenience outlets on all new buildings. The proposed ordinance with respect to wiring specifications also was discussed by repre-

sentatives from the city of Sacramento electric department.

The meeting proved so successful that it was decided that similar meetings be held every three months for the purpose of discussing electrical problems of the vicinity.

Book Reviews

COILS AND MAGNET WIRE

By Charles R. Underhill, New York, 494 pp. Illustrations, diagrams and tables, 9 x 16 in., cloth, McGraw-Hill Book Company, 1925. \$4.

An engineering treatise of exceptional value to designer and coil manufacturer. This volume presents a thorough, systematic discussion of the factors involved in coil design with tables, formulas, and sample calculations. The uniformity of both electrical and physical characteristics of conductors and insulation and the use of winding machinery have enabled the engineer to determine the proportions of his product within very close limits. By reason of this fact, the author has developed numerous tables and graphs which materially reduce the labor of calculation both for original designs and for the modification of given coil proportions to meet altered specifications.

The thorough treatment of the subject of coil-heating and radiation characteristics is one of the outstanding features of the book. In addition, an extended consideration by other authors is given of the properties and uses of insulating varnishes and impregnating compounds.

Concluding chapters are devoted to a discussion of the more common types of windings, winding machines and to the details of coil construction and testing.

R. E. T.

Agriculture Committee Issues No. 4 Report.—Progress report No. 4 of the California Committee on the Relation of Electricity to Agriculture, issued recently, contains much valuable data relative to electric poultry brooders. It describes the three types of brooder in use, their characteristics, limitations and advantages, gives valuable tables of tests conducted, illustrates heating methods and computes efficiencies. A report of power rates and schedules and a bibliography of recent publications which bear upon the subject or the relation of electricity to agriculture are also available from this committee, whose headquarters is at the University of California Farm, Davis, Calif.

Safety Rules for the Installation of Maintenance of Electrical Supply Stations—Handbook of the Bureau of Standards No. 6.—This comprises Part One of the Grounding Rules of the National Electrical Safety Code. It is in handy form and published to meet the demand for a small booklet dealing with specific parts of the Code. It should be of interest to many. Obtainable from the superintendent of documents at the government printing office, Washington, D. C. Price 10 cents.

Personals

Dr. Leonard F. Fuller, formerly engaged in carrier-current research for the General Electric Company at Schenectady, N. Y., recently has re-affiliated himself with that company and will be attached to the engineering department as Pacific Coast representative, with headquarters in San Francisco. Dr. Fuller was born in Portland, Ore., where he received his early school training. He was graduated from Cornell University in 1912 with the degree of mechanical engineer. After a short time with the National Electric Signaling Company, Brooklyn, N. Y., known to old-time radio men as the Fessenden Company, he went to San Francisco and entered the engineering department of the Federal Telegraph Company. He was made chief electrical engineer of that company in 1913. He developed and built the high-



DR. LEONARD F. FULLER

powered transoceanic radio apparatus furnished the U.S. Navy under contract during the years 1913 to 1919. During the period 1914 to 1918 he took up graduate work at Stanford University and was given a degree of Ph.D. in 1918. In 1919 Dr. Fuller became assistant manager of the Ohio Insulator Company, Barberton, Ohio, but returned to San Francisco in 1920 to devote his full time to the Colin B. Kennedy Company in the development of radio receiving apparatus. In 1922-1923 he installed the carrier-current telephone equipment on the Caribou line of the Great Western Power Company and the same type of equipment on the Pit River lines of the Pacific Gas and Electric Company, the latter being the longest and highest voltage carrier channels in the world at that time. In 1923 he joined the General Electric Company in Schenectady. Dr. Fuller will devote the greater part of his time on the Pacific Coast to carrier-current telephone, carrier-current switch control and similar work.

Col. H. G. Winsor, head of the personnel division of the Puget Sound Power & Light Company, Seattle, recently made an extended trip East, including Chicago, New York and Boston, where he conferred with Stone & Webster officials.

Miles W. Birkett, vice-president and general manager, and Lewis A. Lewis, sales manager, represented the Washington Water Power Company of Spokane at the recent annual N.E.L.A. convention at Atlantic City.

A. K. Baylor, special representative of the General Electric Company, New York, was in Salt Lake City recently in the course of a tour of the Western offices of that company.

R. E. Smith, publicity director, the Southern California Edison Company, Los Angeles, was one of the speakers at a recent meeting of the Electric Club of San Diego.

H. K. Griffin, superintendent commercial department, Western States Gas & Electric Company, Stockton, Calif., paid a visit to San Francisco on business a short while ago.

D. E. Harris, president, Pacific States Electric Company, San Francisco, not long ago paid a visit to the company's Seattle branch.

R. A. Lundquist, chief of the electrical equipment division, Department of Commerce, Washington, D. C., has been appointed export manager of Electric Refrigeration Corporation, Detroit. Mr. Lundquist began his professional career with the Missouri River Power Company, at Helena, Mont., after which he spent some time with the Westinghouse Electric & Manufacturing Company.

J. D. Ross, lighting superintendent for the City of Seattle, addressed the Wynooche Power League of Aberdeen, Wash., a short while ago, urging that city proceed with its proposed municipal power project. Llewellyn Evans, superintendent of the Tacoma municipal light department, also addressed the league on municipal ownership of public utilities.

H. L. Bromley, assistant secretary, California Oregon Power Company, Medford, Ore., recently made a three-day trip to Klamath Falls. In that period he presented ten moving picture programs before high school student bodies, lodges and service clubs.

A. B. Day, vice-president and general manager, Los Angeles Gas & Electric Corporation, paid a business visit to San Francisco a short while ago.

J. W. Devereaux, assistant to vice-president in charge of operation Byllesby Engineering and Management Corporation, spent several days with the San Diego Consolidated Gas & Electric Company a short time ago. Mr. Devereaux was making a general survey of all companies under Byllesby management on the Pacific Coast, his itinerary including properties as far north as Tacoma.

Frank Airey, general manager, Pacific States Electric Company, Los Angeles, recently returned to that city after a short visit to San Francisco.

James McNair, of The Washington Water Power Company, Spokane, has been transferred from the engineering department of that company to a position which places him in charge of maintenance and operating work of the light and power department that formerly was handled by the engineering department.

Walter Funnfynn, of the Seattle Lighting Company, recently won the Northwest doubles championship in a handball tournament in Portland.

A. M. Frost, sales manager, San Joaquin Light & Power Corporation, Fresno, Calif., was among the guests present at a recent meeting of the San Francisco Electrical Development League while on a brief visit to that city.

Arthur Wegner has taken up industrial engineering work with the commercial department of The Washington Water Power Company, Spokane, leaving his position in the engineering department of that company.

R. O. Bremmer, city salesman in Spokane for the Pacific States Electric Company, has been transferred to fill a similar position at the branch office in Portland, Ore.

William E. Barrett, formerly manager of the publicity division, Westinghouse Electric & Manufacturing Company, Denver, has been transferred to a similar position in the company's St. Louis territory.

Thomas L. Nudd, formerly electrical engineer with the Allied Architects' Association, Los Angeles, has entered private practice and has opened offices in the H. W. Hellman Building in that city.

J. W. Ryall, of the Mine & Smelter Supply Company, Denver, has been made a member of the advisory board of the Electrical League of Colorado, succeeding A. E. Bacon. He also has been elected chairman of the jobbers' section.

Rex Cole, president, The Miller Company, Meriden, Conn., lately spent some time in Los Angeles. Jack Presbrey is The Miller Company's representative in that territory.

Ernst Jacobson recently was elected president of the West Coast Power Company, Portland, succeeding A. Welch, resigned. Mr. Jacobson came to Portland from Chicago where he had been Western representative of the United Gas Improvement Company since 1923. He entered the public utility field after his graduation from the



ERNST JACOBSON

University of Wisconsin in 1907, and in 1910 became affiliated with the Peoples Gas Company, Chicago, in the engineering department. Later he became assistant engineer, Public Service Corporation of Northern Illinois, Chicago, and still later, vice-president and chief engineer, Iowa Southern Utilities, Davenport, Iowa. In his new position he will direct the affairs of a comparatively young company owning properties in Oregon and Washington that has before it an extensive program of expansion.

M. H. Beekman has been appointed manager of the appliance division of the Edison Electric Appliance Company, Chicago, to succeed **A. H. Jaeger**, who is now with the Kelvinator Company, Detroit, Mich.

J. A. Turner has been appointed supervising engineer in charge of the resident work on the Chelan power project of The Washington Water Power Company, Spokane. Mr. Turner was associated in an engineering capacity with that company when the Post Falls, Long Lake and Little Falls stations were constructed.

H. C. Rice, assistant manager merchandise department of the Southern California Edison Company, recently returned from a two-weeks' tour of the Middle West. Two days of this time were spent at the Frigidaire convention of the Delco Light Company at Dayton, Ohio. During the rest of the trip Mr. Rice visited with the merchandising departments of the larger public utilities and appliance manufacturers throughout the Middle Western states.

E. D. Kilburn, vice-president of the Westinghouse Electric & Manufacturing Company, New York, was a visitor in Salt Lake City recently, inspecting the local branches of his company. Mr. Kilburn was accompanied by **M. R. Cargo**, of Denver, district manager of the Westinghouse company for Utah, Idaho and Colorado.

George E. Lewis, of the Rocky Mountain Utility Information Committee, was one of the speakers at a meeting held under the auspices of the Men's Dinner Club at Fort Lupton, Colo., a short while ago.

F. E. Seaver, assistant secretary of the Los Angeles Gas and Electric Corporation, has been elected a member of the board of directors of that company to succeed **William Van Dyke**, who has resigned because of prolonged absence from the city. Mr. Seaver has



F. E. SEAVER

been associated with the Los Angeles Gas and Electric Corporation since 1907 when he entered the employ of the company as an assistant bookkeeper. He has held successively the offices of chief bookkeeper, superintendent of Los Angeles office and assistant secretary. In addition to his other duties he has charge of stock sales for the company. Mr. Seaver takes an active interest in affairs electrical and is a prominent member of the Los Angeles Electric Club, of which he is past president.

J. F. Pollard, general manager, Coast Valleys Gas & Electric Company, Salinas, Calif., recently made a business trip to San Francisco.

J. D. Ross, superintendent of lighting in Seattle, has gone East on a trip which will include several of the larger cities where he will study new electrical devices for proposed use in enlarging the Seattle distribution system of the municipal lighting department. Mr. Ross took with him a motion picture film depicting the growth of the municipal light plant and showing the Skagit power development.

George H. Eveland, at different times associated with the Pelton Water Wheel Company, the General Electric Company and the United States Reclamation Service, and until recently a member of the organization of the Pacific Gas and Electric Company, San Francisco, has resigned to join the staff of the Constant Angle Arch Dam Company of that city. The latter company at present is engaged in designing and supervising the construction of the Feather River Power Company's Buck Creek plant in Plumas County, Calif., and Mr. Eveland will be designing engineer for the power plant and substation.

Charles Jernegan, of the bond department of H. M. Byllesby & Company, Chicago, spent a week with the San Diego Consolidated Gas & Electric Company not long ago.

Leo M. Dunn, vice-president in charge of staff, and **J. L. Ray**, manager of supply and equipment department of the Graybar Electric Company, with headquarters at New York City, a short while ago spent a few days in Salt Lake City on their way to the Coast.

W. G. Vincent, Jr., vice-president and executive engineer, Pacific Gas and Electric Company, San Francisco, was one of the speakers at a recent community dinner given at Jackson, Amador County, Calif., under the auspices of the Amador County Chamber of Commerce.

Henry Bostwick, manager of the Pacific Gas and Electric Company's San Francisco district, has been elected president of the Rotary Club of that city.

C. A. Miller, formerly sub-foreman of construction of the Twin Falls division of the Idaho Power Company, is now local agent for that company at Buhl, Idaho. In the past Mr. Miller has held similar positions at Glens Ferry and Caldwell, Idaho.

Francis H. Murphy, illuminating engineer, Portland Electric Power Company, Portland, recently addressed the Greater Portland Association on the subject of "Specialty Store Lighting."

H. W. Emory, of the Collyer Insulated Wire Company, Pawtucket, R. I., recently made an extended tour of the Pacific Coast.

Fred Ueltschi, formerly superintendent of the district garage at Boulder for the Public Service Company of Colorado, has resigned to go to California. Mr. Ueltschi has a record of eighteen years of continuous service in the employ of the power company and its predecessors, and has served in various capacities, among them being substation operator, system switchboard operator and electrician in charge of installation of generating and transformer equipment.

Obituary

Sidney W. Bishop, executive manager of the Electrical League of Colorado, died May 13 in Denver, following an operation for appendicitis. Born in Denver Nov. 12, 1894, Mr. Bishop attended primary and secondary schools in that city and was graduated from the University of Colorado with the degree of bachelor of arts. After graduation he entered newspaper work in Denver, later becoming affiliated with the Great Western Sugar Company. At the outbreak of the World War he enlisted and served throughout and was discharged with the rank of captain. He joined the Electrical Co-operative League, now the Electrical League of Colorado, when it was organized in Denver in July, 1921, and



SIDNEY W. BISHOP

soon afterward became its executive manager. In that capacity he was a fervent worker for the electrical industry in the Rocky Mountain region, and through his efforts the organization which he headed became a factor of great importance. Some of his achievements brought him wide recognition. Among these was the innovation of a "Better Christmas Lighting" campaign, which resulted in hundreds of Denver homes arranging attractive electric effects during the holiday season. Several notable electric home displays were exploited successfully under his direction. His success in designing lighting systems for Denver homes and business houses was so marked that some of them became models and wide attention was drawn to them from the electrical industry throughout the country. As a result he frequently was consulted on lighting problems both in his own and in other states. In addition to his other work he acted as correspondent in Denver for the Journal of Electricity. Mr. Bishop was a recognized leader in the electrical industry in the Rocky Mountain region where his genial personality had gained him many friends. To them and to the industry itself his passing is a great loss. He is survived by his widow and two small daughters.

TRADE NOTES

The Foos Gas Engine Company, Springfield, Ohio, has completed the development of a diesel engine which it is claimed has many improvements. A reduction in physical proportions and weight is said to have been accomplished and the engine to have a speed range approximately double that of other designs. The company claims that the weight of the engine has been reduced to about 50 lb. as against 100 to 300 lb. per hp. in other designs, that it is enclosed completely and its lubrication is completely automatic.

The Edwin F. Guth Company, St. Louis, has perfected a new totally enclosed unit known as Guthlite, which it claims embodies new and distinctive features; is not only artistic in appearance with beautiful contour and excellent decoration, but is most efficient in operation. An adjustable white porcelain enameled reflector directs the light so as to secure a wide distribution with uniform intensity on the working plane. Guth spring globe-holding device firmly holds globe without rattling. The manufacturer claims Guthlite is suitable for almost any installation and may be used on any type of ceiling. It is made in four different styles with three sizes in each type.

Collins Kelvinator Company, Los Angeles, and Leo J. Meyberg, San Francisco, sales representatives of the Kelvinator Corporation, have fourteen carloads of Kelvinators enroute and on order for immediate delivery.

Guilbert Brothers, 276 W. Santa Clara Street, San Jose, Calif., have been appointed as representatives in that territory for the Electro-Kold Corporation, Spokane.

Graybar Electric Company, New York, has issued a 1926 fan catalog for alternating and direct current circuits. The catalog is produced in convenient pocket size, containing 47 pages. Photographs, diagrams and complete price lists as well as detailed descriptions of the various types of fans are given.

Fred W. Carlson, sales engineer of the Crouse-Hinds Company, has opened a permanent sample room at 309 Lowman Building, Seattle, where a complete display of the company's products will be shown.

Pittsburgh Transformer Company, Pittsburgh, Pa., has issued bulletins No. 2052 and 2053 which discuss some advantages of Pittsburgh polyphase distribution transformers and Pittsburgh distribution transformers single-phase and polyphase.

The Brown Instrument Company, Philadelphia, has issued catalog No. 92 on the Brown resistance thermometers for measuring temperatures from -300 deg. to +1,000 deg. F., indicating, recording and controlling. Photographs and drawings illustrating the thermometers as well as complete price lists are included in the catalog.

Paul W. Koch & Company, Chicago, has placed on the market a new combination pipe bender vise, which will bend $\frac{1}{2}$ in. and $\frac{3}{4}$ in. conduit, making accurate bends, angles, radii, etc.

Detrick-Joslyn Company, Los Angeles, has been organized to succeed the Baker-Joslyn Company. The new organization will be located at 110 North Alameda Street, that city, and will continue under the management of M. L. Joslyn as president and H. S. Detrick, vice-president and general manager.

The Lindley-Dunning Manufacturing Company, Germantown, Philadelphia, is the new name of a company recently incorporated to manufacture pumps and equipment for electric refrigeration. Elmer D. Dunning, formerly vice-president and general manager of the Dunning Compressor Company of Homesburg, Philadelphia, has given up all active duties in that company and will devote his entire attention to the new corporation.

The McGill Manufacturing Company, Valparaiso, Ind., has placed on the market the new Levolver "Twi-Lite" switch, a small series multiple switch suitable for installing in shallow canopies, portable bases, chandelier bodies and wherever space is limited. This switch dims the light and when dimmed only one-third of the current is used, it is claimed. The three point switch gives "on," "dim" and "off."

The United Electric Company, Canton, Ohio, has issued a folder describing the advantages and conveniences of The Ohio, "the cleaner with the self-starter." The folder is illustrated with photographs and drawings.

Harold E. Trent, Philadelphia, manufacturer of electrical heating and control appliances, has appointed John V. Calhoun sales manager. Mr. Calhoun was formerly engineer of furnace construction with Combustion Engineering Corporation, New York City.

General Electric Company, Schenectady, has designed and now is marketing a new line of synchronous motors for general-purpose application. These motors are recommended to drive any load whose torque requirements have heretofore been met with a standard squirrel-cage induction motor.

Jefferson Electric Manufacturing Company, Chicago, has developed what is known as the Jefferson "Nucode" transformer, which has a 10-volt secondary and a capacity of 25 watts. It is recommended for the average residence or small apartment to operate bells, buzzers, annunciators and door openers.

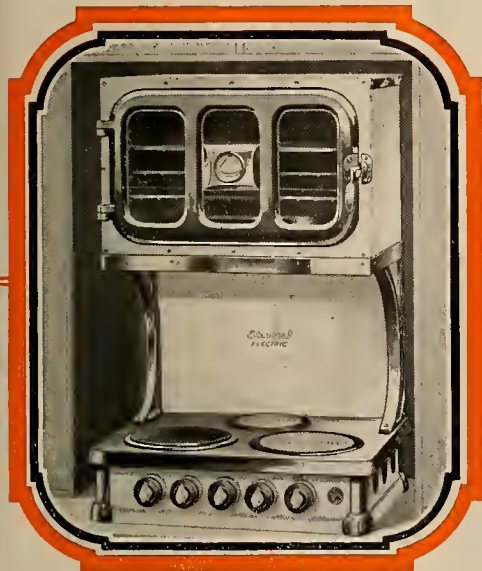
Trico Fuse Manufacturing Company, Milwaukee, has announced the new Trico "Cleartop" fuse, a non-renewable plug fuse of unique design and construction. Some of the distinctive features claimed for it are: large rugged knurl around top edge, clear India mica window, visible link with amperage stamped thereon, large center contact, and each fuse is guaranteed to show when it blows.



Women of the industry in Spokane are wide awake to the value of practicing resuscitation from electric shock and drowning and are setting the pace in demonstrating the Schaefer method of prone-pressure treatment. A four-girl demonstration team has been organized by the Spokane section of the Women's Committee of the Northwest Electric Light and Power Association. Miss Ruth Wilson is shown applying the Schaefer method to Miss Alfernia Culler, posing as the victim. The demonstration team (inset) consists of the Misses Alfernia Culler, Margaret Hicks, Edna Cottrell and Ruth Wilson, all employees of The Washington Water Power Company. The team was organized under the direction of Miss Mary K. Walsh and J. B. Fiskien.

Journal of Electricity

Devoted to the Economic Production and Commercial Application of Electricity
IN THE ELEVEN WESTERN STATES



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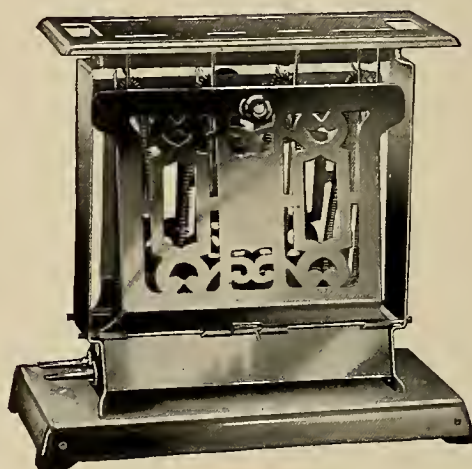


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IN THE ELEVEN WESTERN STATES

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Personal Representation

NOT all members of an association find it possible to attend its conventions. Not all workers in an industry can drop the work at hand to listen to and discuss means of improving that work. For service must be rendered continuously at home.

If those who go to the conventions to take part in these discussions could bring back and relate to their fellow workers every salient detail of the proceedings, that condition would approach perfection. Yet few have the faculty to report successfully all phases of thought brought out in a convention, even if it were physically possible for them to tell all their fellows what they heard there.

It is here that the Journal of Electricity serves the individual member of the industry as not even those who attend the conventions may. At the Pacific Coast Electrical Association convention in Los Angeles, June 8-11, and at the Northwest Electric Light and Power Association convention at Spokane, June 14-17, the Journal will have trained representatives there for you, to report all the salient details of the proceedings. These men, from experience and training, know how to bring you a graphic picture of the convention, digest its important thoughts for you, and present the story in attractive form to be read at your leisure.

In its publication of the convention papers of both these associations, the Journal prepared the way for those who attended the meetings and gave those who could not attend the meat of the year's work of the numerous committees. In its full reports of the conventions themselves, in the July 1 issue, the Journal will provide a section-by-section view of the industry's work for the year.

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EDITORIAL

Gifford Pinchot and His "Giant Power" in Reverse

WAS it a last-moment qualm that after all "Giant Power," whatever it was, would not nominate him to the senatorship of Pennsylvania that caused Gifford Pinchot, whilom figurehead of a movement to place power production among the other inefficient government enterprises in the realm of business, to issue his little brochure, "GIANT POWER, What IT IS and How TO GET IT" (the capitals are his)? If it was a qualm, Governor Pinchot guessed more nearly right in this instance than he has done on electrical development problems so far, for the recent primary election left him very much out of the race. In fact he practically had elected a man conceded to be inferior to Mr. Pepper, who lost because Mr. Pinchot drew from him many votes to which he was entitled.

For many years Gifford Pinchot has mouthed the words "Giant Power" as if there were in them some new kind of charm, some potent magical significance. But if his little pamphlet did not nominate him, it did one thing. It explained what "giant power" is. And one cannot be too sure that the only magic he was able to perform was the magic of disillusionment, and that it "hocus-pocused" him out of office most effectively.

For here is Mr. Pinchot's definition of the difference between "super-power" and "giant power," his own pet:

"The unification of the electric network into a single nation-wide system by the interconnection of regional pools of power is clearly indicated. The process, driven by the motive of profit, hampered by the mutual jealousies of the profit seekers, unaided and unchecked by public guidance for the common good, is super-power. We could not stop this process at any step if we could. We can and we should aid it and guide it for the common welfare. So aided and guided it is Giant Power. Between these two ideas there is an irrepressible conflict in which, as many signs foretell, the zero hour is at hand."

So this is "giant power!" It would seem that Mr. Pinchot was a bit behind times with his wonderful discovery. By this token if power development is not regulated and guided today for the common welfare by the public service commissions of practically every state in the nation, Mr. Pinchot, by his undue precocity would be the last to find it out. As for the zero hour, if it was ever at hand, it passed quite uneventfully some years ago.

Another "startling discovery" made by Governor Pinchot was that state or government ownership would not accomplish the job. He says: "Adequate public control must be established without delay. A system of private ownership under public regulation, though imperfect, is now established in every state and in the great majority of cities. A general system of public ownership could not be established throughout the nation or in many states without long delay in preliminary discussion. This delay would give the monopoly time to dig into a strong line of defense. We must at once make the system of private ownership as serviceable as it could be made by forceful public regulation."

From the pages of his little booklet one finds phrase after phrase devoted to expounding principles so well established already that to read them makes one wonder if it is Rip Van Winkle who is speaking and these his remarkable discoveries as to how the world should be run, when that world already has gone far ahead of his brilliant "discoveries."

If Governor Pinchot had started out to write a story of Jack the Giant Killer, his brochure might well have gone into literature as a gem of fairy folklore for children, but if he is concerned with discovering new ways for the advancement of civilization surely it might be well for him to be sure that he is not discovering the obvious and thereby making himself ridiculous.

The Fixed Idea

About the Wynooche

WHEN an idea becomes fixed in the public mind it is hard to shake loose. A certain group of people in the Northwest have been led by specious argument of municipal-ownership proponents to believe that hydroelectric power is cheap, that cheap power brings industry, and that the best means of producing the desired conditions as to power supply is through municipal ownership and operation. Seeing the strategic position of the district of Gray's Harbor, Wash., as a potential field for power utilization and the presumably excellent power site on the Wynooche River near Aberdeen, these proponents inserted their wedge at this point and convinced those people that always are susceptible to this sort of thing that the municipal development of the Wynooche was just the thing Aberdeen needed to put it on the map.

Along with this basic idea has been fixed another—that \$2,000,000 will develop it adequately and

economically. Some years ago an engineer, without having exhaustive data at hand, estimated its cost at this figure, and later and less complete reports, accepting these data as conclusive, found substantially the same cost. Now it appears that the people expect engineers to use this figure as a premise, and, working from it rather than toward it, to set up a column of costs that will add to about that total. In short, the idea that the Wynooche will cost \$2,000,000 has become just as firmly fixed as is the original idea that the Wynooche would make a good municipal development.

But shrewd guardians of the public interest deemed it wise to seek advice from various sources and had the city retain the engineering firm of Stevens & Koon, Portland, to make a report. Imagine the chagrin of the proponents when these engineers, after a thorough examination of more complete data than were available for former reports, found that it would cost \$4,500,000 to build, and that it would require nearly \$1,000,000 additional to offset its operating deficit until it should become self-supporting. These engineers worked independently of their predecessors; took nothing for granted; studied the situation carefully; attacked the problem from a detached, professional standpoint, not colored by personal prejudice. They noted the character of the ground; studied the stream-flow records; recommended a certain sized development in steps as the most economical cost-per-horsepower development possible; estimated the growth of the community; recognized that the city would have to compete with an established company in marketing its product and that it couldn't get all the business at once; and, finally, advised the city to defer the development, and, if it was intent on entering the power business, to build a small steam plant with which to acquire sufficient load to warrant the construction of the larger development later.

Of course this report was unsatisfactory to the proponents of the project on the city council, the private utterances of whom we imagine to have been as follows: What heresy is this? Don't these engineers understand that the people know the Wynooche project will cost \$2,000,000? Don't they know that this is a hydroelectric project involving the use of the people's God-given heritage and not merely a proposition of finding an economical way to go into the power business? Don't they appreciate the fact that we can't write a snappy story about a steam plant, or paint a pretty picture of a fuel pile by a tall stack? Don't they realize that in order to get the people to vote the bonds our "ad" writer must have material around which to weave some romance?

Publicly they said they wanted more information and retained W. J. Roberts, consulting engineer, Tacoma, to make a report. His report stated that if former estimates (exclusive of Stevens & Koon's) were correct, and if the community grew at a certain rate, the project would be entirely feasible and would be profitable from the start. Fine, we can imagine the politicians saying, this is something

we can show the people. Thus do municipal-ownership enthusiasts seek the facts.

Promptly on receipt of the Roberts report the city council proposed, through ordinance, a special election to vote \$2,000,000 of bonds for the project. The outcome will be watched with interest. Will the people demand the truth before voting, or will they accept the appearance of truth as presented by those whose ideas are fixed and unchanging in the face of any sort of contrary testimony, or by those who want municipal development at any cost? What would be the status of the Skagit development today if the people of Seattle had known in 1918 that it would cost upward of \$13,000,000 instead of \$5,000,000 as they were told?

Electric House-Heating Warrants More Attention from Industry

THE electric industry as well as the major portion of the general public does not appreciate the fact that electric heating for residences and apartments is proving an outstanding success when properly installed and properly sold. The development of this class of business has been pioneered by a small handful of enterprising men on the Pacific Coast who have gone ahead despite lack of co-operation, and in some cases in the face of actual resistance on the part of other men in the industry who either have been misinformed or who have been too disinterested to learn the facts.

Attention can be directed to any number of installations in California, Oregon and Washington where electricity performs all of the household burdens from cleaning the rugs to cooking the meals and heating the house. Then there are many apartment houses which are completely equipped with electric appliances and which, according to the assurances of the owners, are in particular demand among tenants.

Data covering ten homes in Seattle recently have come to the editor's desk that bear out these statements. All of these homes have electric ranges, water heaters, the average number of other household electric appliances and, in addition, heating installations varying from 8 to 29 kw. The number of rooms varies from 3 to 7, the number of electric heaters from 8 to 17. The bills for electric service, covering lighting, heating and cooking, are surprisingly low and compare favorably with the charges for the same services, irrespective of the character of the fuel used. For the smallest installation the average monthly bill for the year 1925 was \$8 per month; for the largest installation, which included 29 kw. in heaters in a 7-room house, the average monthly bill was \$17.35. The maximum average monthly bill for all ten installations was \$18.60, this in a home with 24-kw. in heaters.

In the face of data which is at hand and of experience with this application of electricity to date, it would seem that electric house-heating deserves more attention from the industry than it is receiving. It is high time that the industry itself should be sold on this application.

Are Some Executives Suffering from Case of "Sales Bashfulness"?

MANY utility executives apparently put on an entirely different suit of mental garments when they turn their attention to the matter of merchandising than they are accustomed to wear when considering the ordinary problems in selling electrical energy. In an excellent article entitled "Light—A Merchandising Opportunity" in the May issue of "Light," James E. Davidson, past president of the National Electric Light Association, coins the phrase "sales bashfulness" to describe the attitude of many of our public utilities toward appliance sales. To quote from Mr. Davidson's article: "Looking back into the history of our feeble efforts at merchandising, I recall how bashful we were about the electric flatiron. Our imagination was paralyzed by the thought of asking folks to pay \$2.50 for one of our electric irons when they could buy a cast iron sad-iron for 35 cents at the hardware store. I recall that we had similar timid inhibitions in the matter of electric signs. I have observed the same diffidence within the past year with respect to kitchen lighting units. We offered cheaper fixtures than the public was willing to pay for and equipped them with smaller lamps than the public would gladly buy."

To correct this condition Mr. Davidson has three suggestions: first, engaging of men who have the selling instinct; second, the granting to these men of a compensation commensurate with that paid in the market place, basing this compensation upon the net value of their work as load-builders and not solely upon their ability to sell merchandise at a profit; third, a properly organized sales program which will meet the load-building needs of the utility and at the same time serve the public to whatever extent the public properly may desire. A careful consideration of these three precepts will lead the thoughtful individual to the conclusion that they are the "without which not" of a successful merchandising policy.

Oakland Water and Power Project Is Subject of Excellent Report

EXTREMELY worthy of comment are two phases of the recent report on the power possibilities of the Mokelumne River prepared by Lester S. Ready, chief engineer of the California Railroad Commission, for the Citizens' Water Committee of the Oakland Chamber of Commerce as reported in the news pages of this issue. Mr. Ready in his report states that the substitute plan offered by the committee for the Lancha Plana water project upon which that section of California now is embarked, even though a considerable amount of power is involved, will not decrease the cost of water to the public one cent.

In graciously accepting this report the Oakland sponsors of the combined water and power project have displayed a marked spirit of broadmindedness.

In securing expert testimony as to the feasibility of the project before definitely launching the city into a program of expenditure whose final total would remain in doubt, the Chamber of Commerce has adopted a broadgage viewpoint that is unique, because many municipalities under similar circumstances have blundered into costly programs with no careful investigations as to the ultimate outcome.

Furthermore the selection of the Railroad Commission's chief engineer for a task of this kind reflects to the credit of that body. The accuracy, detail and unbiased viewpoint disclosed by the report gives an indication of the fairness, justice and precision of the investigations by the commission's engineers in matters of rates for public-utility services relating to the public.

On the whole, the report is a credit to its sponsors, its author and the people of the East Bay district who in the long run are the actual beneficiaries.

The Public Be Told

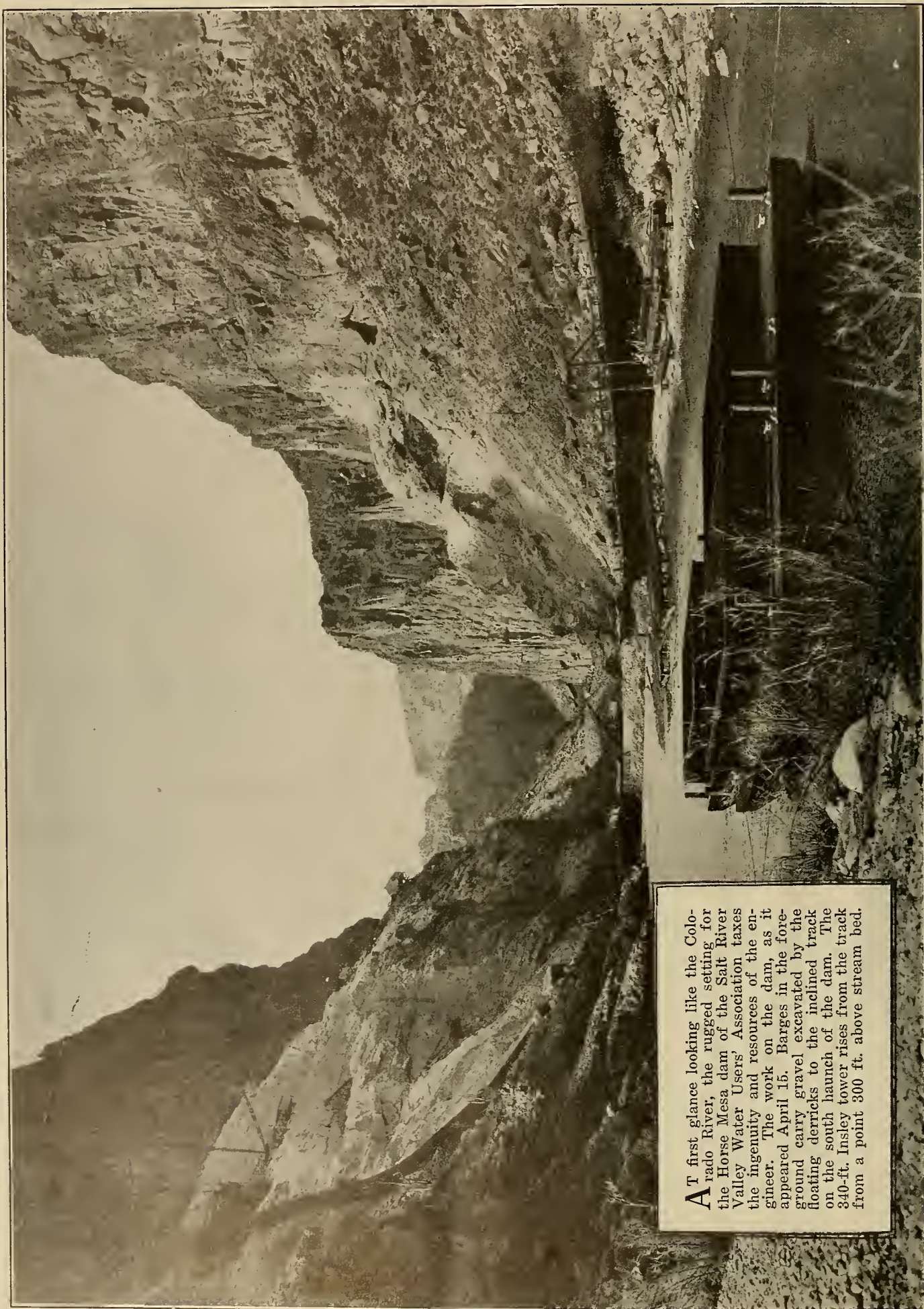
CHANGES in the viewpoint of those entrusted with the conduct of our large industrial organizations are taking place that seem to have elicited little or no comment. Nevertheless, these changes are really radical in their nature, if comparison is made with conditions as they existed only a few years ago.

Consider the almost brutal frankness of the present-day financial statements of great corporations. The story is there, be it favorable or unfavorable. The public is told in great detail just what have been the results of the last year's operations.

Then there were the so-called "trade" secrets, so jealously guarded in the old days. Nobody was allowed to tell anybody anything if it could be avoided. Manufacturers used all sorts of freak sizes, gages and standards so that they might, presumably, have a "cinch" as far as orders for repairs were concerned.

Now, competitors in the same line of business sit down at the table together. They co-operate in the adoption of standards by which a greater interchangeability is brought about, all for the benefit and better service of the consumer. They promote general educational research and advertising that the public may be informed thoroughly and protected against that which is shoddy and below standard.

Even the holy of holies, the plants where the goods are manufactured, are open to visitors. "Visitors Welcome" has taken the place of "No Admittance," and "Keep off the Grass" is no more. How different this all is, and how much better to let the sunlight of frankness into the darkness that formerly obscured the ways and processes of industry!



AT first glance looking like the Colorado River, the rugged setting for the Horse Mesa dam of the Salt River Valley Water Users' Association taxes the ingenuity and resources of the engineer. The work on the dam, as it appeared April 15. Barges in the foreground carry gravel excavated by the floating derricks to the inclined track on the south haunch of the dam. The 340-ft. Insley tower rises from the track from a point 300 ft. above stream bed.

Selling 11,500 Customer-Owners in Five and a Half Days

By James Lightbody

Publicity Manager, British Columbia Electric Railway Company, Ltd., Vancouver, B.C.

IT was with some trepidation that plans were launched a year ago by the British Columbia Electric Railway Company, Vancouver and Victoria, for embarking upon the customer-ownership idea. As has been announced in the news columns of this magazine, any fears proved to be groundless because out of a population of 350,000 the company received applications for \$7,155,300 worth of 6 per cent cumulative preference shares in its subsidiary, the British Columbia Electric Power and Gas Company, in five days and a half, obtaining 11,500 customer-owners in its effort.

Among the conditions which made the prospects doubtful, to say the least, was the comparative lack of knowledge regarding investments on the part of the general public of Vancouver. With the exception of the regular investing public, very few people in the city owned or ever had owned stock. Many had owned Victory bonds but these mostly had been sold for homes or automobiles.

Again, little was known as to the general wealth of the British Columbia communities. They had come through hard times during the war and even at the present day the number of wealthy men is possibly lower than in other cities of similar population. A large proportion of the population is of the wage-earning class, which was hard hit during the slackening of industry from 1914 to 1918.

What was not reckoned with, however, was the thrift of these people and the other non-investors who had been putting dollar after dollar into the savings banks during the last five or six years. They had been steadily buying their homes and liquidating their obligations, and now there was a large volume of ready cash belonging to these people in the banks.

Looking back, these facts are readily apparent but when facing the launching of a customer-ownership campaign, several questions seemed uppermost in British Columbia. Was \$2,250,000, the original offering, too much for 350,000 people to absorb? Would people who had been used to real-estate buying and similar forms of speculation be

IN its initial customer-ownership effort the B.C. Electric Railway Company established a most remarkable record, obtaining 11,500 customer-owners in the short period of five and one-half days and at the same time over-subscribing the issue offered by \$2,155,300. In this article the author deals with the steps which led up to the campaign and the publicity which was used to make it a success.

attracted by a safe, steady dividend of only 6 per cent? Was public opinion sufficiently favorable towards the British Columbia Electric Railway Company and all public utilities to induce investment by the non-investing classes?

About a year before the campaign was to be launched George Kidd, president of the company, placed details of the matter in the hands of a committee of three, consisting of the general secretary, the comptroller and the publicity manager.

The price of issue, the amount, the terms and many other details were thrashed out, and the plan of campaign decided upon was an orthodox one used by other companies. As this was the first customer-ownership venture, it was not thought to be the time for experimenting.

The British Columbia Electric Railway Company is an English company and all its shareholders and most of its bondholders live in Great Britain. To make customer-ownership possible it was decided to organize a new subsidiary company under British Columbia laws, which would avoid the disadvantages of British income tax and British money units. The formalities of getting this new company, named the British Columbia Electric Power and Gas Company, launched took considerable time and were not completed until a few days before the customer-ownership campaign was due to start.

At the outset the committee decided to use the time available inducing a favorable frame of mind on the part of the public towards the company and public-utility investments. For many years the company had been using publicity continuously but largely to solve problems of the moment, such as jitney competition, the need of higher fares, municipal-ownership agitation and so forth. There had been times when the balance of opinion was somewhat against the company and when favorite election platforms were "anti-B.C. Electric."

The change in public opinion possibly is due to a large extent to the steady educational work that has been carried on. It is also true, however, that with the material prosperity that has come in recent years people have become more tolerant. The

old spirit of criticism was due partly to the reaction of the war.

Then, too, there is nothing which promotes good feeling towards a public utility company so much as a program of construction. During the last five years the British Columbia Electric Railway Company spent \$12,000,000 on new construction. Last year the amount was \$4,500,000. The company was one of the first to throw itself into the building program, anticipating the present building boom by at least three years. Possibly the height of the company's popularity was reached when it announced in September, 1925, that it would proceed with the development of Bridge River at a cost of \$13,000,000 for the first stage and \$30,000,000 for the first four stages. The public likes a free spender.

Such has been the peculiar nature of Vancouver people that the company in the past has been reluctant to publish figures showing the growth of business. In spite of a desire to prove the expansion of the communities it served, the company found by experience that any figures published generally were seized upon by politicians and wrongly used to argue for more service, lower fares or lower lighting rates. One of the first moves decided upon was to reverse this policy. It was realized to be necessary to "talk up" the electric power, transportation and gas industries if people were to have such faith in them as to induce them to invest their savings in them. Figures were published showing how the power output was growing at the rate of 10 per cent per annum, how the street railway system, carrying 71,000,000 passengers in 1925, had exceeded all previous records, how the amount of gas manufactured had nearly trebled in ten years and so forth.

The fundamental points which the company endeavored to impress upon the public were somewhat as follows:

- (1) The essential nature of electricity, gas and electric transportation in the community.
- (2) The progress being made by public-utility companies in general and by the British Columbia Electric Railway Company in particular, including the increase in the demand for its services.
- (3) The extent of the company's property, the amount already invested and the program of future expansion.
- (4) The policies and ideals of service of the company.

About six months before the date set for the campaign the company conducted five excursions to its Stave Falls plant, having as guests members of the provincial legislature and civic and municipal councils, bankers, financial men, business men, engineers and newspaper men. Although at this time the public knew nothing of the proposed issue of shares, these trips had a marked effect upon the sale.

The company also has been pursuing a policy of steadily reducing its domestic lighting rates since

1917, when the rate in Vancouver was 8.8 cents net per kw-hr. In 1925 it was 5 cents net with a secondary rate based on a certain consumption per 100 sq.ft. of 2 cents. In the fall of that year the company announced, first, a reduction of more than 10 per cent in its commercial lighting; second, a reduction in its small power rates, and third, on Jan. 1, 1926, a reduction in the domestic lighting rates in Vancouver from 5 cents to 4½ cents net per kw-hr., dropping to 2 cents in the second step.

This progressive policy of reducing rates and building power plants in anticipation of future growth won unanimous approval for another reason. In spite of the fact that Vancouver is surrounded by streams and has an ample rainfall, there is nearly always a shortage of water for sprinkling purposes each summer. Whatever may have been the cause, the newspapers and the public generally contrasted the forward-looking policy of the British Columbia Electric Railway Company and its great projects with the inadequacy of the water supply of the city authorities.

These matters are recited because, when the sale of shares was commenced, sales were made almost entirely upon the public's opinion of the company formulated as a result of past performances and only slightly because of actual selling effort.

As proof of the way public good will had been won, it may be mentioned that, as contrasted with various municipal-ownership agitations in the past, agitation in December, 1925, failed to excite the people of Vancouver in any way and died a natural death. An effort was made by some recently arrived promoters to nominate and elect a slate of aldermen pledged to a municipally owned power scheme. Not only could no slate be nominated but the two candidates who enlisted under the banner were left at the foot of the poll in their respective wards.

The work of the campaign began about three months before the date set for opening the sale. Following out the fundamental points already set out, publicity was released through four main channels, showing the expansion of the company, the growth of water power development, gas manufacture, etc. These channels in order of the strength used were (1) the company's weekly publication in the street cars, (2) street car cards, (3) newspapers, and (4) illuminated billboards and posters.

An effort was made to familiarize the public with the physical properties of the company, such as remote power plants, substations, dams and so forth. All advertising carried cuts of such properties; billboards displayed them in vivid colors, and an automatic stereopticon in the company's main interurban stations flashed picture after picture before hundreds of persons.

An essay competition for employees, although conducted in midsummer, uncovered a great deal of talent and directed much attention to this phase of company policy which was to have a marked bearing on the outcome of the customer-ownership campaign.

As far as any predetermined campaign was re-

DAVID HALL SIGN CO.

Next!
Thirty Millions
Bridge River Power
BRITISH COLUMBIA ELECTRIC RAILWAY CO.

FOR 29 YEARS
- DEVOTED TO THE PROGRESS AND
DEVELOPMENT OF BRITISH COLUMBIA -
BRITISH COLUMBIA ELECTRIC RAILWAY CO.

Our Faith in a Greater Vancouver
\$ 4,500,000
for new power gas and
railway facilities in
1925
British Columbia Electric Railway Co.

It's Great to Live in Vancouver
-where there's **GOOD**
Public Utility Service
BRITISH COLUMBIA ELECTRIC RAILWAY CO.

C. Electric

ESSENTIAL SERVICES
6% ANNUAL DIVIDEND
INSIDE GET INFORMATION
An Extra Pay Check every 3 months
6% ANNUAL DIVIDEND

SUCCESS for the recent customer-Ownership stock sale of the British Columbia Electric Railway Company was due in large measure to the advertising preparation which preceded the actual sale of stock. In this advertising effort the company's use of billboards served it in good stead, for the company's message to the public upon billboards was flashed where the public was accustomed to look for its messages. For many years a consistent user of display advertising, the company thus found itself in excellent position to tell its story. On this page are shown several of the billboard messages and a window display which preceded the stock sale.

sponsible for the success of the sale, it may be said that publicity as just outlined had a most far-reaching effect. It opened the eyes of the public to the great progress being made by public utilities. It raised the electrical, gas and street railway industries in people's estimation and gave them a vision of the places they would hold in the community of the future. It further showed them the stability of the British Columbia Electric Railway Company, which was engaged in catering to such essential demands—services that were not subject to fluctuations with the coming of good or bad times. Herein lay one of the secrets of success. The non-investor is timid about putting his money into many local enterprises. Many had been "stung" before. It was the absolute faith of the man or woman with a few hundred dollars in the savings bank in the integrity of the "B.C. Electric" and its management that made them eager to hand over their money for shares. In this regard the characters of George Kidd and W. G. Murrin, president and vice-president, respectively, had a considerable bearing. One subscriber for five shares frankly declared that he subscribed because of his "confidence in the present management under Messrs. Kidd and Murrin."

One of the first steps in the campaign was the publication of a comprehensive special number of The B.C. Electric Employees' Magazine, replete with halftones of company property and with charts showing the rapid expansion of the company's services. This booklet also was published for public consumption under the title of "Twenty-nine Years of Public Service." By means of a coupon printed in "The Buzzer," the company's publication in the street cars, 2,500 requests for this booklet were received from the public.

In preparing for the campaign the committee decided to keep strictly to organization lines, working only through department heads. Each employee was asked to submit ten prospects to whom would be mailed a folder. A sales manual was printed and every possible assistance given to the employees who had never sold a share of stock in their lives before. Speakers' classes were arranged so that fully trained speakers might be sent to outlying points to address employees on how they might sell shares and make commissions.

Of the \$2,250,000 offered, local bond dealers underwrote \$1,500,000 and employees were allotted the remaining \$750,000 to buy for themselves or sell to the public. For various reasons the company did not wish to put an issue on the market without giving bond dealers an opportunity to participate. The latter had explained that there was not another good local stock available in any quantity.

This double selling campaign made it necessary to hold back all advertising until the date set for release, namely: March 19. With the clearing up of all legal entanglements, it was impossible to prevent bond dealers and those employees who were "in the know" from talking about the stock even if application forms were not available. Besides, the business community was agog with talk about the

impending issue. Consequently the date of the campaign was pushed ahead to March 15, in spite of the fact that folders, advertising and even the distribution of application forms could not be completed by that date.

The first day's sales, therefore, were accomplished without the aid of any advertising whatever and on that day practically the entire employees' allotment was sold. It was only by the third day that the advertising began to be felt and on that day applications were brought in by employees for \$1,400,000. Employees had been assured that they would be allowed sufficient time to get to their prospects and for this reason the sale could not be closed for five and a half days. In that time applications were brought in totaling \$5,655,300, exclusive of the brokers' amount of \$1,500,000, which was sold in the first two days.

At the close of the campaign the company found itself with \$2,155,300 in applications that it could not fill and yet dozens of applications were received after the closing date and thus not recorded. During the day or two before the close it was the common experience of all employees to have friends call up and beg them to move heaven and earth to have their applications filed in time.

The carefully planned campaign for the most part was forgotten. Employees who had not thought of exerting themselves to sell stock found that it was so easy they could not help sending in applications. Altogether out of a permanent payroll of 3,000 no less than 1,500 employees earned commissions. Then 1,270 employees themselves purchased shares. Employees on the street cars, in the gas plants, line departments, union employees as well as office employees—every branch of the company's services participated in the campaign.

It was found necessary to issue the entire \$5,000,000 of shares authorized but as applications for a total of \$7,155,300 had been received many had to be cut down drastically. The limit had been placed at 50 shares but no one applying through employees received more than 10 shares.

Of the reasons for the success of the campaign there is considerable to be said. The shares were 6 per cent cumulative preference, dividends being guaranteed by the parent company. This guarantee placed them next to the parent company's bonds and, after the payment of the interest on these bonds, the company last year had \$1,860,000 available for dividends on stock ranking after this issue. In other words, taking the amount offered, namely \$2,250,000, the company had available earnings sufficient to pay dividends fourteen times over. It is doubtful, however, if the majority of applicants thought about these figures. The company never has made a practice of publishing its financial figures. The response therefore was an indication of the sublime faith of the public in the financial stability of the company.

Next in order as a reason for the success of the campaign must come the ease with which the public

GAS Servant of Man

Of the modern services none plays a more important part than gas.

In the home it is replacing kerosene because it is efficient.

On such sound economy and convenience electric gas has reached the 100,000 cubic feet mark.

There are no B. C. Electric employees who do not know the value of gas.

BRITISH COLUMBIA ELECTRIC POWER & GAS CO.
VANCOUVER

Carrying 71,796,794

THE B. C. Electric carried that number of passengers in 1925—a record in its whole history.

People must have transportation. Street car, interurban lines, bus service are essential services.

That is one reason for the continued stability and progress of the B. C. Electric Railway Company—devoted, since 1897, to the development of British Columbia.

BRITISH COLUMBIA ELECTRIC RAILWAY CO.
VANCOUVER

Essential Services

TRANSPORTATION, electricity, gas—these three services are the most basic, the most essential to the present-day community life.

People must have organized services. Without electricity, gas, and transportation, life would break down much more than it does now.

The necessity indicated by the demand for them is individual.

BRITISH COLUMBIA ELECTRIC RAILWAY CO.
VICTORIA

Electric Service—a basic need

THE electric power companies of this continent generated in 1925 68,000,000,000 kilowatt hours which were supplied to 19,000,000 customers.

Never in its history has the electrical industry recorded a decrease in its annual revenue.

The B. C. Electric on its part supplied 390,000,000 kilowatt hours in 1925 to 45,000 customers—this also constituting a record performance.

BRITISH COLUMBIA ELECTRIC RAILWAY CO.
VICTORIA

Would you like an Extra Pay Cheque every 3 months?

READ **The Buzzer** NEXT WEEK

In Cars Friday, March 19

The Conductor on this car is any B. C. Electric Employee. He can take your application for

B. C. Electric Power & Gas

6% Cumulative Preference Shares

How You Can Share in B. C. Electric Earnings

SEE THIS WEEK'S **BUZZER**

In Cars Friday, March 19

Have an extra pay check every 3 months

Buy **B. C. Electric** 6% Cumulative Preference Shares

Save and invest at home in **B. C. Electric** 6% Cumulative Preference Shares

\$10 down and 9 monthly payments

"Ask any B. C. Electric Employee"

4 DIVIDEND CHECKS every year

January, April, July, October

BC Electric POWER & GAS CO.

6% Cumulative Preference Shares

APPLY HERE FOR

BC Electric Power & Gas Co.

6% CUMULATIVE PREFERENCE SHARES

Only \$10 Down per Share

Rest may be spread over nine months

Par Value \$100 • Price \$90 a Share

DIVIDENDS 6 PER CENT

Guaranteed by B. C. Electric Railway Co.

Dividend Cheques mailed every 3 Months

Any B. C. Electric Employee or Office will take your order

BRITISH COLUMBIA ELECTRIC RAILWAY CO.

British Columbia Electric Railway

devoted to the progress and development of British Columbia

PUBLIC UTILITIES

Supply necessary services which are indispensable to the everyday life of modern communities

B. C. Electric Railway

In 1925 the **B. C. Electric** generated **390,000,000** kilowatt hours of electricity

Electric Power Companies are among the world's greatest industries

GAS

—also an essential utility

Gas Service has been supplied in Vancouver for 40 years!

B. C. Electric Rly. has been continuously "At Your Service" since 1897

Electricity — Gas and Transportation

In 1925 the **B. C. Electric** manufactured **837,774,700** Cubic Feet of Gas

Gas Service is an essential modern convenience

B. C. Electric Light and Power Customers: **1915 - 53,738** **1925 - 87,400**

A Progressive Company in a Progressive Province

In 1925 the **B. C. Electric** carried **71,152,985** passengers

People MUST have Transportation Service

Samples of advertising used before and during the customer-ownership campaign. Across the top are typical newspaper ads; the balance are car cards.

could subscribe. Many persons with no knowledge of bond dealers or stock brokers are at a loss to know how to invest. On the other hand, there were 3,000 employees of the British Columbia Electric Railway Company, distributed throughout 350,000 people. There were a score of offices at which people were in the habit of paying their light and gas bills. Further than that, they were in daily contact with the company, in its street cars especially. This combination of familiarity with the company and ease of purchase was a most effective one. It is safe to say there was hardly a person

who did not know personally one or more employees of the company, and many people once they knew about the shares called up their employee friends and gave them the order.

The British Columbia Electric Power and Gas Company now has about 11,500 customer-owners, which is more than 13 per cent of its total light and power customers. Of the 10,245 applications received by employees, 8,049 were for five shares or less and 3,156 for only one share each. More than 40 per cent of the permanent employees now own shares.

First Aid—How?

By W. E. Richmond

San Diego Consolidated Gas & Electric Company

TO accomplish effective first-aid instruction requires constant and painstaking patience, even though effort is required no longer to "sell" safety-first ideas. Whenever and wherever safety measures and first-aid instructions have been adopted their value is so palpably apparent from any and every point of view as to be beyond question.

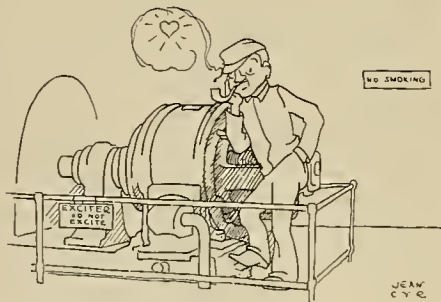
Organized efforts to reduce accidents, eliminate hazards to life and properly to instruct employees in rendering first aid to the injured now are recognized as a part of our national industrial life.

Show 'em—Don't Tell 'em

Now, the above statements possess the smug, well-satisfied, oily smoothness of flowing sound which falls so gently upon the ear of the person that prefers only to hear praises sung when anything is said concerning the conduct of his business. Tell some people that their "organized efforts" along any certain line are not worth the powder to blow them anywhere but to certain failure and you at once become popular with yourself—and nobody else.

The moral is, then, "Don't tell 'em." Get in and dig, and let them learn to know you by your works.

"Self-protection is the first law of nature." Sounds good, but if you believe it you never have got right



"... the trance they like to call work."

down among working men and watched them "protect themselves" while moving about in the trance they like to call work. The very fact that there is a real necessity for first-aid and safety-first work is positive proof, prima facie evidence, and all the rest of it that the greatest necessity of everyone of us human beings is protection, and that principally from ourselves!

There is real need for first-aid instruction which will get over to the men what not to do as well as what to do in case of accident.

The other day a lineman ran a hook through his cheek, making a gash an inch and a half long, sev-

ering a small artery and in general making a nasty wound. The foreman, who of all the crew should have known better, put some spirits of ammonia in water then washed the wound with that mixture! One of the first principles of first aid is "Do not wash wounds with any liquid if the patient can be



"Teach every employee all that you can get him or her to absorb about HOW to render PROPER first aid."

taken at once to a doctor, or a doctor to the patient" except under very extraordinary circumstances. As this patient was in the doctor's hands within twenty minutes, the proper thing would have been simply to cover the wound with a sterilized bandage, of which there were plenty in the first aid kit.

How can we get and hold a 50-per-cent interest of every employee in his own safety while about his everyday job? What is the best method?

Teach every employee all you can get him or her to absorb about how to render **proper** first aid to the injured. This is the best preventive of accident, too, from a purely educative point of view. The only other way to prevent accident is to do no work of any kind which will jeopardize safety! Of course that would indicate that we had better go ahead and educate each other to work safely.

All right, let's go. Going to teach everybody how to give the right kind of first aid. What is the right kind? How can we recognize it when taught us?

The kind of first aid that everybody should know is "proper emergency first aid." What is its function? To prevent further infection by sterilizing the wound; then to protect it with sterile coverings.

Proper instruction informs the student how to do this in the best possible manner **only** up to the point where the patient is contacted with the doctor; that is, under the circumstances immediately surrounding the accident.

Initial Steps

We will assume that the management selects a man and tells him to teach every employee how to render proper first aid. No strings, purse or otherwise; absolutely free rein to put it over. Assume virgin soil to work in, nothing to be torn down or remodeled, the only difficulties within immediate sight being the checking-up on the existing condition of legal safeguards already installed and the condition of first-aid kits and their contents, if any, on hand.

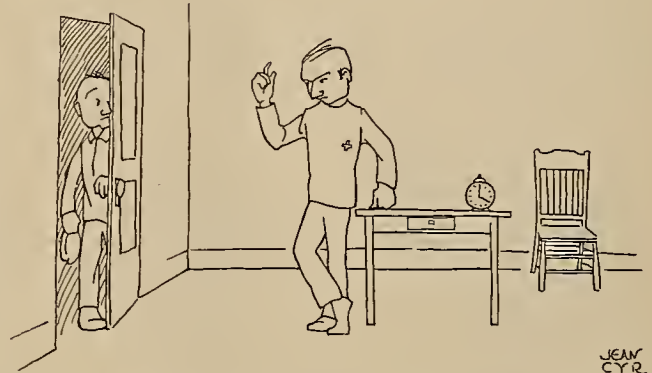
The instructor selects a location central in relation to his field of activity, gets together what he knows is necessary and desirable in the way of thoroughly equipped office and first-aid room and is given the use of an assembly room for a classroom. Letters are written and bulletins posted. The employees are informed that immediate first aid is available; that without cost they may receive instruction and training and learn why and how it all is done.

Incidentally, each patient as he comes in is given, in a conversational way, instruction in accident prevention and in proper first-aid measures to use after an accident. These chances for a little "education" are too good to be passed over.

The instructor continually becomes better acquainted with the men, their habits of thought, ability to absorb and use knowledge, their family affairs and home life, their racial characteristics and how all these affect their work. They come to him with their troubles and with their joys, and this contact results in mutual education.

We now will consider "Doc" to be well established in his routine work, possessed of the confidence of

come. The men are instructed on company time. Their superintendents, with all the good intentions in the world, find it difficult to spare the services of a whole crew for even an hour's instruction. It takes considerable diplomacy and tact to ask the same superintendent a number of times for a class! Yet, taking each crew in rotation as they can be had, it takes a long time to get around with the



"They forget the hour of the class; . . . Gosh! If there's any kind of an excuse they can't think up—well, I have yet to hear it."

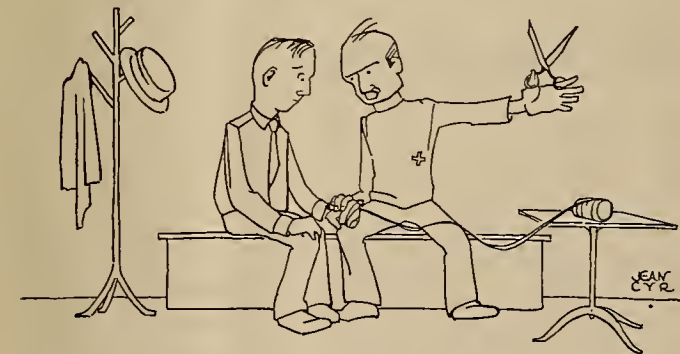
first lesson. The second and third overlap and meanwhile the number of employees grows and it becomes desirable to have more instructors.

To fill this need a number of men are selected, or volunteer, for special instruction as instructors. They are taught in hourly lessons on company time twice each week. More difficulties now have to be overcome, principally in getting an attendance of those chosen for this special instruction. They forget the hour of the class; they consider their own work more important than class work; they are afraid they will be noticed by their boss as neglecting their work for the class work. Gosh! If there is any kind of an excuse they can't think up—well, I have yet to hear it. When you do get them corraled, however, their interest is keen. They sincerely like the work, and they go after it and become of real use to the organization.

"Home Remedies"

In the teaching of safety and accident prevention practices it is not unusual to meet some opposition which has to be overcome. There is a phase of first-aid instruction analogous to that situation in safety work, which is—the chap that is wedded to his use of "home remedies." Because a chew of tobacco clapped on an open wound once worked successfully, or rather no harm resulted from it, he thinks there is nothing so good as a chew of tobacco. Same with a piece of bacon rind, a flax-seed poultice or a red woolen rag.

Every once in a while someone forgets to take the bottle of his favorite patent medicine out of the first-aid kit he brings in to be replenished or repainted and thus lets the cat out of the bag. Yes, there are many "pointers" indicating the need of education as to what is and what is not of real value as a remedial agent for use for first-aid purposes that will not interfere with the measures the



" . . . each patient as he comes in is given, in a conversational way, instruction in accident prevention and in proper first-aid measures. . . . These chances for a little education are too good to be passed over."

his fellow-employees and able to put over anything reasonable and good for them. For some time he has been instructing the various crews in the use of the contents of the first-aid kits and in what to do with nothing at all when the emergency arises.

Difficulties

He has studied the hazards to which the various types of employees are exposed, and his instructions cover these hazards as well as first aid of a general nature. Right here are encountered his first difficulties requiring any special effort to over-

doctor will use when he gets on the case. You can educate, and educate, and you can't always seem to make it stick, but you can keep trying!

On the face of things it would appear that it only would be necessary to order Tom, Dick and Harry to attend classes. In actual practice, however, it does not work out in just that way.

The foregoing remarks are not intended to be discouraging, but just an indication that all is not a bed of roses in this first-aid vocation any more than in any other. This sort of educational work has a wonderfully bright side, and that is seen



"The chap that is wedded to his home remedies. . . ."

every time a snappy safety-first and first-aid demonstration is put on for the public by some of the competing teams at the meets which occur more and more frequently. The work put on by these teams is finer even than it need be, but it can't

help being so, it is bound to work out that way. Practice, practice, practice, is going to result in accomplishing pretty work in any line. Back of all the exhibition stunts and the perfect drill of these teams, you may be mighty sure, stand many years of good hard pounding away at the details of the



"You can educate, and educate, and you can't always seem to make it stick, but you CAN keep trying."

work which produces such fine spectacles. So the management must be very patient as it stands by and watches the growth of any "organized" effort to help men help themselves.

Experience has hearteningly taught that once the men are given a chance they will learn all you give them to study, even work nights at it. Every now and then one of them comes around and says, "Well, Doc, you have given me such a start that I guess I will study to be a doctor," and, sure enough, some of them do that very thing. First aid and accident prevention work pays well.

Editor's Note—Discussions of the foregoing dissertation will be welcomed by the author. Not only discussions but remarks lengthy or otherwise either in support of, in amplification of or contrary to Mr. Richmond's opinions and suggestions will add to the possible value of the paper and expand the efficacy of first-aid work. Communications may be forwarded either to the Editor, Journal of Electricity, or to Mr. Richmond.

Distribution Facilities for Increasing Domestic Load Densities

By M. T. Crawford*

Superintendent of Distribution, Puget Sound Power & Light Company, Seattle

RAPID increase in the use of the electric range and electric water heater during the past few years has transformed the load of the residence which formerly required a few hundred watts to an individual load of around 8 kw. or more. Distribution systems, generally, have been able to take on satisfactorily a reasonable amount of this load, but in localities where ranges are being connected by the thousands it has been necessary to consider radical changes in distribution practice to meet economically the new conditions. The plans devised by the Puget Sound Power & Light Company to meet these new problems in residential distribution may be of interest.

Among the principal factors which determine the design of any distribution system are the characteristics and requirements of the load and the load density per unit of area. The necessary require-

ments having been met, maximum economy is always essential. Residence service requires a reasonable high service continuity and good regulation. Voltage regulation has been planned to come within a normal maximum range, approximately two per cent each way from the lamp standard of 120 volts.

Load density is a variable factor which normally increases. Starting with a newly opened suburban addition with only a few houses to the block, very light load densities are obtained at first; but these increase during a development period up to the time when all lots are improved. Then may follow a partial apartment-house period, when conditions are favorable, with even greater load density. The distribution system under discussion is designed for conditions between these limits and does not consider rural lines or solidly built apartment, hotel or commercial areas.

In designing the system certain conditions were

* Abstracted from a paper before the Fall, 1925, Pacific Coast Meeting of the A.I.E.E.

laid down. The diversified feeder demand was estimated to average 500 watts per residence having only lights and small appliances, 1,250 watts per residence having a range also, and 1,600 watts per residence having a range and water heater. An average city block was taken to be 0.004 sq. mile, which will include from 16 to 20 fair-sized lots and the necessary street area. An average maximum load density was set at 25 kw. per block of 17 houses, estimating five homes with range and water heater, eight with range alone and four with lights

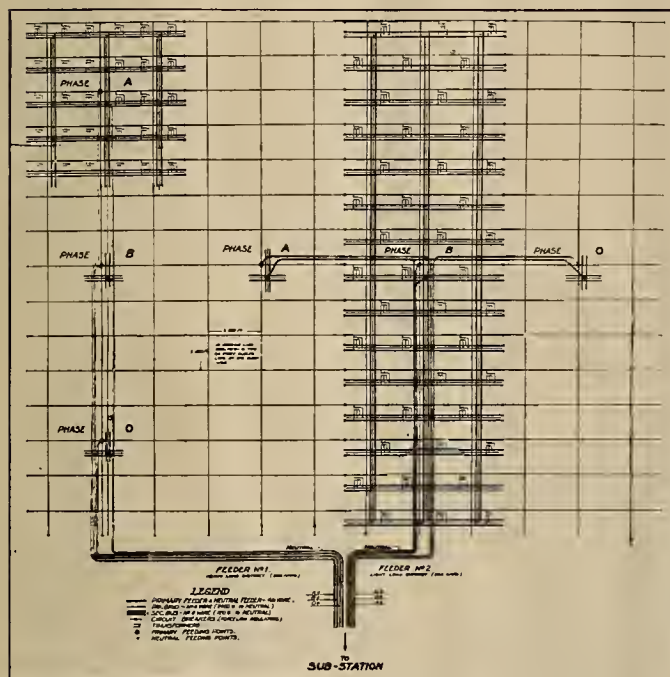


Fig. 1. Diagrammatic outline showing principles employed in overhead distribution system for residential area with complete development in upper left-hand corner on phase A of feeder No. 1.

and appliances only, plus a 30-range apartment house every six blocks. On this basis the load density would be 6,250 kw. per sq. mile.

It was planned to construct a distribution system which, without reconstruction, could be added to as the load density increased. The lines are so laid out that at first when the load density is light only a portion need be built. The plan was to cover the entire residential area with a grid form of service network of uniform conductor size, irrespective of load density. Increases in load density then can be taken care of by running out additional feeder capacity and tapping this grid at more frequent intervals.

A nominal primary distribution voltage of 4,500/2,600 volts, four-wire, three-phase, star-grounded, was employed, supplying single-phase service by means of three-phase feeders which are balanced as nearly as practicable by dividing the service area into three uniform load sections for each feeder.

The secondary bus or street mains consist of three No. 4 wires of uniform size at all points, operated on a single-phase Edison, three-wire basis with neutral grounded. Where practicable the bus is built longitudinally along the streets or alleys and at intervals of approximately every two blocks,

or about 800 ft., cross ties are installed over cross streets between the longitudinal runs. By this means a solid grid network is constructed. For the ultimate load density a maximum size of five by six or thirty blocks is standard. Insulating circuit breakers are placed in the bus around the edge of this grid to separate it from adjoining net works except that no circuit breakers are placed in the neutral conductors.

A single-phase, primary grid of one No. 4, weather-proof wire is installed parallel to the secondary bus as to both location and area. Standard 10:1 transformers are installed between the primary and secondary grids at such locations as the load demands up to an average of one 25-kw. unit in the middle of each block. The secondary bus neutral is used also as a primary return from the grounded side of the transformer to the feeding point in the center of the grid.

For load densities at present anticipated, primary feeders from the substation are of standard size No. 4/0 copper. Four wires are taken out for a three-phase feeder and three 30-block areas supplied therefrom, chosen as far as possible so as to be of average uniform distance from the substation. When the three-phase primary feeder reaches a central point in this load area, each of the three-phase wires branch off and tap into the center of the No. 4 primary grid, covering one of the 30-block areas.

Branches from the neutral feeder follow each single-phase primary branch and tap the neutral grid at the same point where the primary grid is tapped. Additional taps may be made from the neutral feeder wire to various points in the neutral grid when necessary as determined by neutral current tests. These are made periodically and at the same time the transformer loads are measured. Not less than one No. 4/0 neutral is installed along the route of each feeder from the substation to all feeding points but where several feeders take the same route one neutral conductor only may be installed for their combined use.

The accompanying diagram shows the plan in outline. For the average block size and uniform load distribution careful calculations were made of network currents and voltage gradients to check the wire and equipment sizes and spacings adopted as standard.

In actual practice block sizes and shapes vary considerably, and load densities vary from block to block, but these conditions are met successfully by adjusting the size and location of transformers.

The above design is for the presently anticipated ultimate load density where a 300-amp. feeder will be loaded in a 30-block area. Starting with very light load densities, feeders may be operated at 200 amp. and one feeder may be used to supply a much larger area. Three of the 30-block areas referred to, which are ultimately to be used to load the three phases of a 3-phase feeder, are combined into one 90-block area and the circuit breakers omitted from the primary and secondary grids so as to make a one-grid network over the entire area. The single-

phase No. 4/0 branch feeders, ultimately to supply separate grids of smaller extent, are spliced together and taken to the station as one single-phase feeder. In extremely light load densities two 90-block areas are served by one No. 4/0 single-phase feeder, but their primary and secondary grids are kept separated by circuit breakers. A 90-block area is considered a maximum which it is good practice to operate on one secondary grid for reason of service continuity.

This system has been in successful operation for the past few years, replacing a 2-phase, 4-wire distribution network. Briefly summarized, its advantages may be said to be construction economy under conditions of light load density at first, followed by rapid growth in more or less unforeseen localities, and ability to meet the more exacting requirements of voltage regulation and service reliability demanded by increased domestic use.

County Fair Home-Lighting Exhibit

By J. P. Fairbank

Extension Specialist in Agricultural Engineering, College of Agriculture, University of California.

FARM lighting was given more space than any other exhibit at the last San Diego County Farm Bureau fair, held at Balboa Park, San Diego.

During the past year the Agricultural Extension Service of the University of California has done considerable work on the better lighting of farm homes in San Diego County. Each year previously the county farm advisor and the home demonstration agent put on an exhibit at the county fair showing but one or two phases of the varied activities done in and by the rural communities of San Diego County. For last year's fair, however, co-operation was given by the San Diego Electric Club through the loan of equipment by its dealer members.

Full-Sized Rooms

Three full-sized rooms were built, wired and lighted. A kitchen 9 x 14 was shown complete with an electric range, sink and work table. It was lighted by two brackets and a kitchen unit. This room merely demonstrated a well lighted and conveniently arranged kitchen.

Two living rooms, each 14 x 14, were identical except as to lighting and wall and ceiling colors. The first, a "horrible example," was finished in brown and was lighted with an old-time chandelier having four crystal globes with a 60-watt lamp in each. This fixture not only failed to light the room well but also caused glare, to say nothing of its appearance.

The other living room was finished in tints of light buff and cream. Here the lighting equipment included brackets with ivory-tinted lamps, a portable table and a bridge lamp, and a ceiling unit composed of a 100-watt lamp in an enclosing globe having neatly etched decoration.

When all the lights were on each room was using 240 watts, and the contrast was apparent to the

most casual observer. To bring out the contrast further the room circuits were switched on and off by a motor flasher, lighting each room alternately at 5-second intervals. The public did not enter the rooms but viewed them from the aisles.

Women members of the Home Department of the County Farm Bureau were in attendance and ably answered questions and discussed features of the exhibits with all who were interested. The five lighting outlets in the well lighted living room gave an excellent opportunity to demonstrate the effects to be obtained from different combinations of lighting equipment.

The attendants and the placards emphasized the following four simple requirements for farm home lighting: (1) Enough light. (2) No glare. (3) Good distribution. (4) Pleasing appearance.

The Reflection Values of Colors

Other smaller display sets were arranged to show details of home lighting. To show color reflection five miniature rooms were arranged in a row, each finished in a different color or combination of wall and ceiling colors. Each room was lighted by a G. 18½ 25-watt all-frost lamp held in the ceiling by a sign receptacle. Placards in each room showed the reflection efficiency of its particular tint.

Comparison of Lighting Units

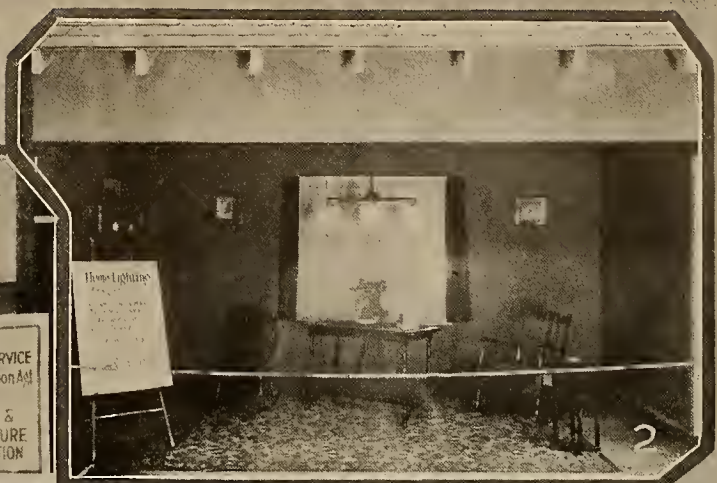
A booth with seven compartments, each 2½ ft. wide, 2 ft. deep, with a ceiling 7 ft. from the floor, was used to compare units as to light distribution and appearance. All compartments were finished in a gray, and placards in each indicated the approximate distribution of the light as given by the unit suspended above it. As more than seven types are in common use, these units were readily removable so that others could be substituted in a few seconds.

The Selection of Lamps

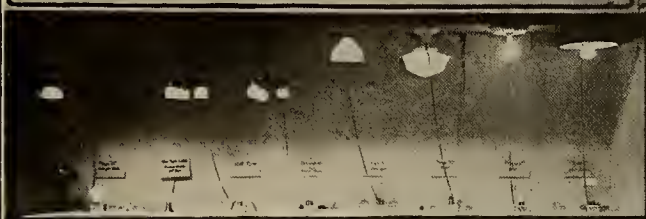
To illustrate the point that the right lamp is the first step in obtaining good lighting, a display was made of eight different types of lamps and the class of units in which the lamp could be used to advantage.

In addition to these a series of colored charts was made by the home demonstration office showing good and bad types of reading lamps and the effect of their position in relation to the eyes and the book.

Over 1,000 sq. ft. of floor space was given over to the lighting display and more than a week's time devoted to its installation. Some 30,000 people attended the fair, not all of whom saw this exhibit, to be sure. Nevertheless, an appreciation of better lighting was, we think, taken away by a lot of folks, both of urban as well as rural residence. Furthermore, it showed many business and city people that the Farm Bureau and the Agricultural Extension Service is not only interested in developing better crops and herds but also in creating better homes and living conditions in the "back country" where live the city folks' friends, customers, clients and fellow taxpayers.



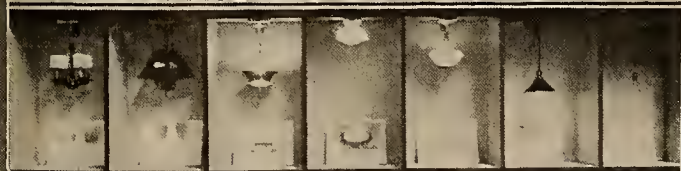
THE SELECTION OF LAMPS



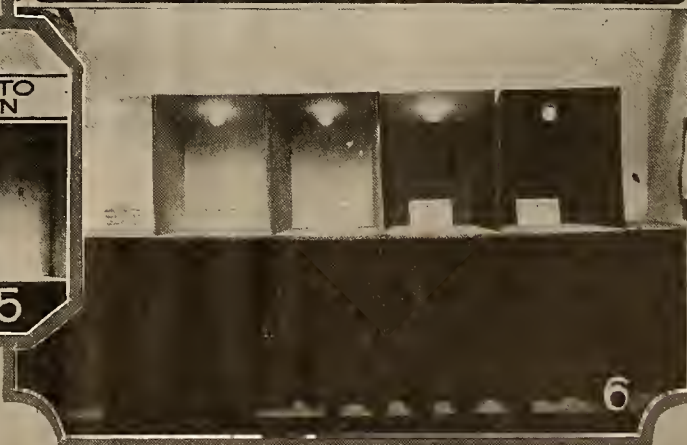
EXHIBITS of the Agricultural Extension Service of the University of California at last year's Farm Bureau fair in San Diego, showing the proper use of light and lighting equipment in the farm home. (1) The farm kitchen properly lit. (2) A "horrible example," or out-of-date method of lighting and decorating the living room. (3) The living room, with light-tinted walls and bright decorations, properly lit. (4) An exhibit of the various styles of bulbs and their proper uses. (5) An exhibit to compare different types of lighting fixtures and show their particular efficiencies and adaptabilities. (6) Small booths, lighted by the same sized lamp in each case to demonstrate reflection values.

CEILING AND WALL COLORS THEIR REFLECTION VALUES

COMPARISON OF LIGHTING UNITS AS TO APPEARANCE AND LIGHT DISTRIBUTION



5



6

CENTRAL STATION CONSTRUCTION OPERATION AND MAINTENANCE

X-Ray Used to Locate Faults in Submarine Cable

Definite Visual Inspection of Cable Joints Possible with this Novel Method; Cost Only Limitation

By F. E. DE SILVIA, General Foreman Underground Lincs, Puget Sound Power & Light Company, Seattle

The need for some adequate means of finding defects in the insulation of submarine cable was brought forcibly to attention through the operation of a 6.6-kv. cable across a portion of Puget Sound from Seattle to Vashon Island. A series of failures occurred in this cable. After each of these the cable was tested out and the point of breakdown repaired by cutting out a section containing the defect and splicing

the tension on the copper, expanding under heat, caused it to move through the soft mass of rubber so that upon cooling it would be off center. Also it was known that in some instances, due to lack of uniformity of pressure and temperature, gas and air pockets formed in the insulation. The great difficulty in connection with such faults was not so much that they existed as that a visual examination of the com-

impression of the cable was produced on the screen. In this impression a narrow, dense, nearly black line between wider lines of less density and of lighter shade represented the copper conductor inside the rubber insulation. Any irregularity in the insulation was immediately apparent; gas and air pockets showed up as lighter spots within the darker areas. After reaching a stage in the experimentation at which reasonably clear results were being produced photographs were taken with the idea of studying the nature of the different kinds of defects.

Figure 1 shows decentralization in a splice made in the field. This is perfectly obvious at a glance and needs no further explanation except to say

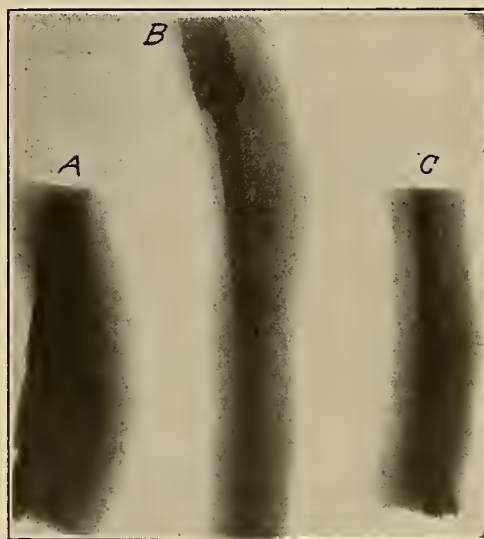


Fig. 1. Showing decentralization of conductor in field splice, the outward appearance of which was normal.



Fig. 2. Showing piece of cable as originally received from factory. Light grey spot is air pocket; darker spot is gas pocket.

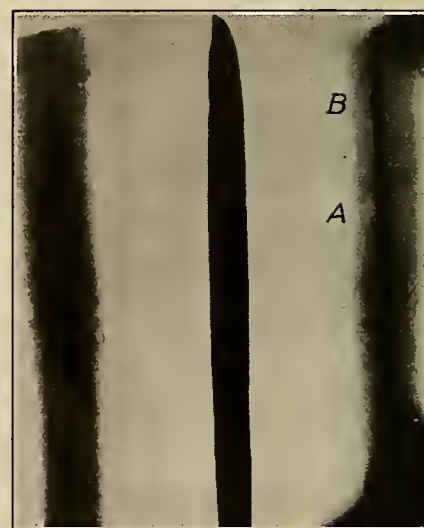


Fig. 3. Disclosing a large gas pocket (A) in original cable insulation and large nubbins on conductor (B) permitting corona.

ing the ends together. After a time the failures became so frequent that a new 13-kv. cable was laid and the old cable was taken up for more complete repairs.

Although some of the failures had occurred at points where splices had been made in former repairs a number had occurred at factory splices and still others at points where defects in the original insulation existed. These defects took the form of gas and air pockets in the insulation, of non-adhesion of the rubber to the conductor and, in the case of some factory splices, of an imperfect brazing job on the copper in which small nubbins were left, permitting the deleterious effect of corona action.

The difficulties in obtaining a perfectly insulated splice in any ordinary cable used in underground work were well known. For instance, it was known that decentralization of the conductor within the insulation occurred when during the vulcanizing process

pleted job would not disclose their existence. The common practice of introducing into the vulcanizing bath a test splice and of later cutting open this splice to see if the job was all right was only partly effective, since occasionally faults would creep into the service splice that would not occur in the test splice. The only indication of this would come later when the service splice failed in service.

The idea that an X-ray might be applied to the inspection of cable splices came when the writer had an X-ray examination of himself. After some experimentation with a small portable X-ray machine, such as is carried around by physicians for use in the homes of patients, a faint shadow of the conductor through the insulation was obtained upon a fluorescent screen. This was secured by using 40 kv. at 5½ milliamps. Further experiments then were made on a large machine until finally, using 140 kv. at 7 milliamps. with a 7-in. spark, a distinct

that from outward appearances it never could be detected. Such a splice would be returned to service and only after a failure at this point would it be known that the splice had been faulty.

Figure 2 shows a piece of cable as it came originally from the factory. The light grey spot is an air pocket and the slightly darker spot is a gas pocket. This was proved later by puncturing the insulation at these points with a needle attached to a vacuum test tube and analyzing the gases drawn off. From the places where the lighter shadings showed a pocket the gases were mainly oxygen and nitrogen, or practically an air mixture. Lead and copper sulphate were found in the pockets marked by the darker shadings. The point to be emphasized in connection with these defects is that they existed in the cable as originally shipped from the factory and only through a later failure would their presence normally be known, and

then of course at the expense of a costly service interruption.

Figure 3 discloses a large gas pocket (a) in the original cable insulation, and (b) a defect in the conductor (b) where large copper nubbins are plainly visible, allowing corona action to take serious effect. In the left cable in this picture is seen a thin air space next to the conductor indicating non-adhesion of the rubber due to faulty vulcanizing. In this space ionization through corona action will take place, eventually causing a failure.

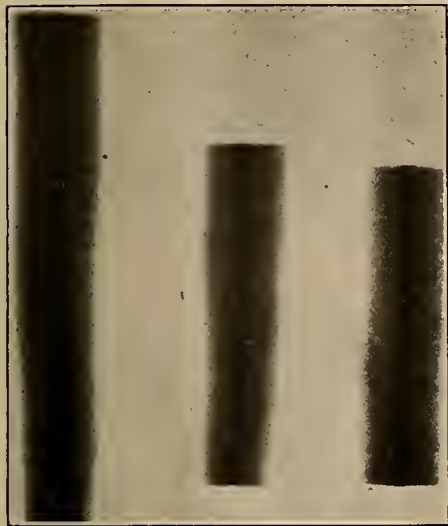


Fig. 4. Showing opposite ends of a factory splice, illustrating poor adhesion of insulation and nubbins on conductor due to poor brazing.

Figure 4 shows opposite ends of a factory splice, again illustrating non-adhesion of the insulation and copper nubbins left on the conductor by imperfect brazing.

Having seen the kind of inspection that is possible by the use of the X-ray, the next question is, how can the process be used in actual practice. A number of possible uses at once will suggest themselves, but of course the practicality of them will be determined in the main by the cost. While this cost may prohibit the use of the process in ordinary routine underground work it seems probable that, due to the extreme importance of splices in submarine cable, this company will find it economical to use it on all important splices in such cable both when it is being laid originally and later in maintenance work.

Another possible use for X-ray inspection is at the factories of cable manufacturers. Where conditions seem to justify the cost the cable, after its insulation is vulcanized, could be drawn slowly through the X-ray so that its impression would be projected upon a fluorescent screen. An inspector then readily could detect flaws which could be cut out, enabling a practically perfect cable to be sent out from the factory.

Still other possibilities are apparent. The method could be applied perhaps to inspecting insulators and other equipment relying for its efficiency upon the density and uniformity of the insulating substance. Further, it might be applied to finding the causes of transformer or oil-switch failure before tearing down the apparatus, a procedure which frequently obliterates the cause before it is found. Only the more obvious applications have been

suggested, but before any use is attempted it would be prudent to study into the cost and to determine the justification of such cost. Possible development in the X-ray machines themselves, through which they may be better adapted to the particular problems involved, may assist in making their use practical for the many problems of the operating company and manufacturer.

New 60-kv. Tie Line Presents Interesting Features

By C. B. CARLSON, Structural Designing Engineer, Southern California Edison Company, Los Angeles

To tie together two important parts of the 60-kv. transmission system the Southern California Edison Company found it necessary to traverse some rough country. The line replaces an older line built on wood poles and obviates the hazards of brush and grass fires. Starting at the Saugus substation on the Kern River No. 1 transmission line, the new line bears in a southwesterly direction across the Santa Susana Mountains to the head of the Simi Valley. Saugus is an important switching point on the Kern lines and is immediately adjacent to both the Big Creek 220-kv. lines. Thus the Simi Valley district in effect is brought closer to a major power supply than as fed previously from a smaller substation a few miles farther south and also on the Kern lines.

The new line from Saugus was designed for a normal operating voltage of 110 kv., although at present it is insulated and energized only to 60 kv. Consideration first was given to the possibility of using steel poles and triangular configuration in the line.

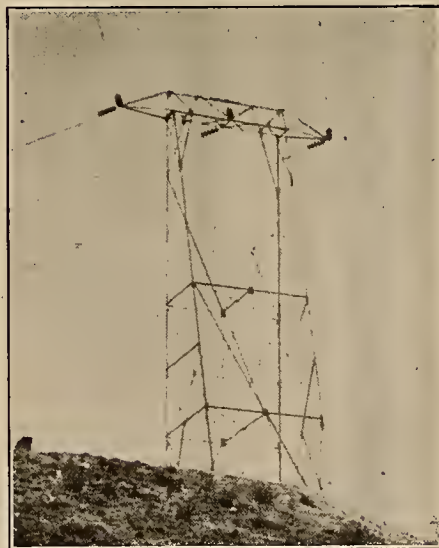


Fig. 1. Angle tower, 58-deg. angle.

However, studies and designs brought out the fact that with but a very small additional structure weight a tower could be provided. Stringing the line on flat-type towers permitted the following highly desirable conditions:

1. Horizontal configuration.
2. Conductor separation of 13 ft. horizontally.
3. Narrow tower base, facilitating the obtaining of the right-of-way.
4. Angle and anchor structures self-supporting, thereby avoiding difficulties of guyed structures.

Earth footings were used for all of the towers. The standard suspension towers have a 2-angled footing, allowing thereby a resistance not obtained by the ordinary single-angle anchor. Angle and anchor towers are fitted with tripod footings having sufficient base angle area to develop bearing and to furnish uplift resistance. The maximum horizontal angle in the line is 58 deg. This angle was made on a single tower and without guying as indicated in Fig. 1.

Framing details are shown in Figs.

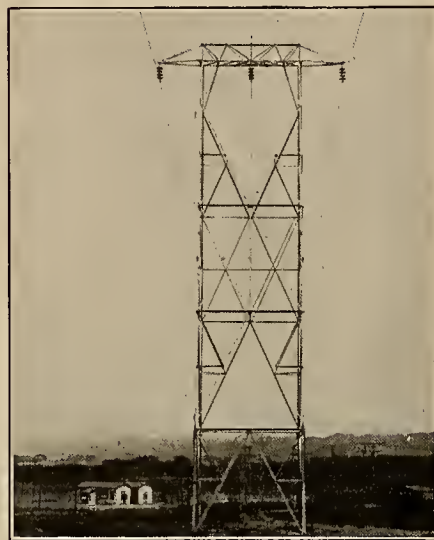


Fig. 2. Standard suspension tower with 14-ft. level extension.

2 and 3. It may be noted that the scheme of framing used permits almost a direct-line transmission of stress down into the footings. Standard and anchor towers measure 52 ft. to the crossarm, without extensions. The towers were designed on the basis of the use of high-elastic-limit steel galvanized by the hot-dip process. The security of all bolted connections was insured by the use of spring washers under the nuts. Tower weights are as follows:

Standard tower without footings.....	3,000 lb.
Standard tower footings.....	544 lb.
Anchor angle tower without footing.....	4,040 lb.
Anchor angle tower footings.....	912 lb.

Various types of side-hill and level extensions were used to advantage in adapting standard towers to conditions imposed by the profile of the territory traversed. Two transpositions were made in the line using the type of transposition tower shown in Fig. 4. Two towers and three spans effect a complete transposition. Close scrutiny of the illustrations will show the bird guards installed in strategic locations over each conductor. These guards are made of saw-toothed strips of galvanized sheet metal and fastened to the towers where the close proximity of a bird to the conductor would constitute a hazard. This type of bird guard affords an exceedingly uncomfortable resting place for birds and has proved successful in several applications.

Normal spans are 750 ft. and stress the 4/0, stranded-copper conductor to 17,000 lb. per sq. in. Three cases of spans over 2,000 ft. were encountered, the longest being 2,341 ft. There are 68 structures in 13 miles of line, mak-

ing an average span length of 1,000 ft. over the whole line. Actual stringing values varied from 17,000 to 20,000 lb. per sq. in. at maximum condition which was figured for 25 deg. F. with 1/2 in.

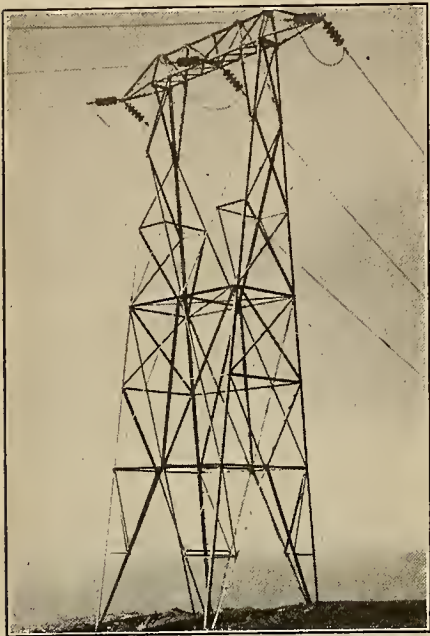


Fig. 3. Close-up of anchor tower showing bird guards in place.

on ice and a wind load of 6 lb. The sagging was done in pulls of approximately 1 mile, with the aid of a transit.

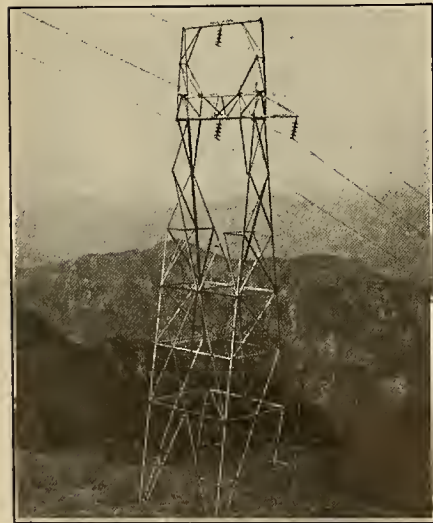


Fig. 4. Transposition tower. Background shows nature of country traversed.

The line was erected by the company's construction department, and the design and the sagging of the cables were done by the company's engineering department.

Seven distribution substations of the San Antonio (Texas) Public Service Company are to be outfitted with complete supervisory control, according to the Westinghouse Electric & Manufacturing Company. The supervisory control is to care for the high-tension loop breakers as well as the low-tension distribution feeder equipment. Provision for future installation of remote load-indicating devices also is to be made.

Shasta Substation Provides Interstate Tie

By E. A. CRELLIN, Assistant Engineer, Division of Hydroelectric and Transmission Engineering, Pacific Gas and Electric Company, San Francisco

The latest addition to the 220-kv. substations of the Pacific Gas and Electric Company is known as Shasta substation. It is located about two miles from Cottonwood, in Shasta County Calif., at the point on the Pit-Vaca 220-kv. transmission lines where the construction changes from two single-circuit tower lines with conductors in a horizontal plane to double-circuit towers with conductors in a vertical plane. The function of this station is to receive power purchased from the California Oregon Power Company and to raise the voltage to 220-kv. for transmission to Vaca-Dixon substation over the Pit-Vaca lines.

Power from the California Oregon Power Company's Copco No. 2 plant is received over a 110-kv. single-circuit transmission line approximately 120 miles in length, carried on wood-pole structures. The 78 miles from Copco No. 2 to Delta, Calif., was built and is owned by the California Oregon Power Company. The balance of the line from Delta to Shasta substation was constructed by and is the property of the Pacific Gas and Electric Company.

It is interesting to note the distance this power is transmitted from its point of generation at Copco No. 2 to the load centers at Oakland and San Francisco. As noted above, the distance from Copco No. 2 to Shasta substation is approximately 120 miles. From Shasta to Vaca-Dixon substation the distance over the 220-kv. lines is 142 miles and from Vaca-Dixon substation to Claremont substation in Oakland the distance is approximately 47 miles. This makes a total transmission of 309 miles. Some of this power also is distributed in San Francisco through Martin substation over the 70 miles of 100-kv. line between Claremont and Martin substations via Newark substation, making a total transmission distance of about 380 miles.

The single-line diagram shown in Fig. 1 indicates the present switching arrangement at Shasta substation. The incoming 110-kv. power is metered and then passes through a Westinghouse type G22 110-kv. oil circuit breaker to the main transformer bank. Figure 2 shows this equipment. The 110-kv. switch structure is of the standard type used throughout the system of the Pacific Gas and Electric Company and is equipped with by-pass and disconnect-

ing switches as well as line-grounding switches. The main transformer bank consists of four single-phase Westinghouse transformers (one spare) rated 13,333 kva. each, making a total bank

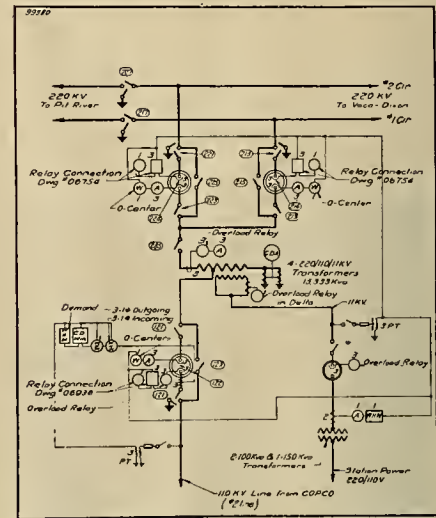


Fig. 1. Single-line wiring diagram showing methods of power control and metering. Shasta substation.

capacity of 40,000 kva. The main winding in these transformers is an auto-transformer to step from 110 kv. Y to 220 kv. Y with the neutral point solidly grounded. In addition to the auto-transformer winding there is a tertiary delta winding with a capacity of 40,000 kva. at 10 kv. At present this tertiary delta is used only to supply incidental power for station use, but is available for the operation of a synchronous condenser should one be required at a future date.

From the 220-kv. terminals of the main transformers the line passes through a single air-break switch and then divides for connection to either of the Pit-Vaca lines through Westinghouse type G-2 220-kv. oil circuit breakers. The 220-kv. switch and bus structure is of the same general type previously constructed at other stations on the 220-kv. system of the Pacific Gas and Electric Company and is shown in Fig. 3. Each oil circuit breaker is equipped with by-pass and disconnecting switches built by the Pacific Electric Manufacturing Company. These air-break switches are of the same type originally designed for use on the 220-kv. system when it first was put into operation between Pit River power house No. 1 and Vaca-Dixon substation.

Figure 4 shows the station-service transformer bank. Lead-covered cables connect the tertiary delta of the main

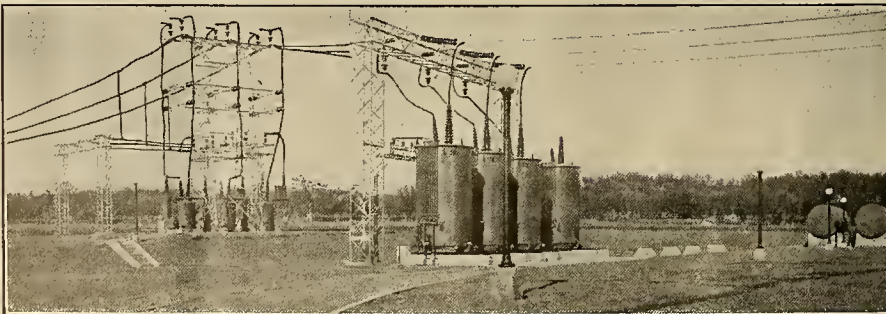


Fig. 2. Main transformer bank and incoming 110-kv. line switch. Shasta substation.

transformer bank to the bus supplying the station bank. This bank consists of two 100-kva. and one 150-kva. transformers to supply 3-phase 220-volt power for pump motors and other small power requirements as well as 110/220-volt service for lighting. The bank is controlled by a Westinghouse type O-221 37-kv. oil circuit breaker. Although the primary voltage of this bank is only 10 kv. it was found neces-

sary. The main transformers are 26 ft. 8 in. high from rail to top of high-tension bushing. This necessitates a high entrance door and crane rail as well as an unloading pit to permit removing the core.

Future possibilities of this station were an important factor in the design of the plant. It is laid out to permit expansion in practically any direction. The building has a temporary end to

distance sufficiently high to necessitate a high voltage to break it down. If this high voltage be supplied from ordinary station sources, the potential power behind it will be distinctly dangerous to those who might be near the line, as previously mentioned.

The equipment here described will bridge any resistance that the normal potential of the arc circuit will bridge, and at the same time it is perfectly



Fig. 3. Side view station building and 220-kv. bus structure. Shasta substation.

sary to use a higher voltage oil circuit breaker in order to get an outdoor breaker with a rupturing capacity sufficient to permit its installation so near the power concentrated in the 220-kv. transmission lines. The small transformers shown on the right of the station-power bus structure are potential transformers to supply all meters and relays with the exception of the meters on the incoming 110-kv.

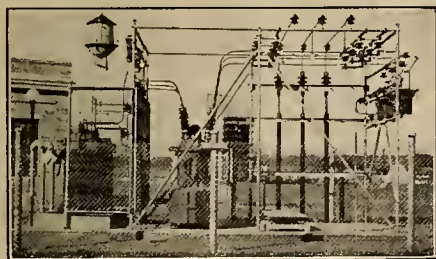


Fig. 4. Station power service bank and equipment. Shasta substation.

power. These latter are cared for by a separate installation of 110-kv. current and potential transformers.

At present the main substation building is of somewhat odd proportions. Its design may be understood better if some of the factors entering the problem are mentioned. Its only function



Fig. 5. Front view Shasta substation; main transformer bank in background.

now is to house the main switchboard, transformer cooling-water circulating pumps, storage battery and motor-generator charging sets and to provide facilities for handling one of the main transformers in case repairs are neces-

sary. permit extension for the housing of synchronous condensers. These at present are unnecessary, but it is entirely within the realm of possibility that the future may see a 220-kv. trunk line running north into Oregon and Washington. In this event Shasta substation will become an important switching junction and probably will have a large synchronous condenser installation to care for voltage regulation on the 220-kv. lines. For this reason the present installation was made extremely flexible, and all construction was made with the idea of future extension with the minimum possible alteration to existing equipment.

Line Tester Does Job Well and Does it Safely

By W. E. RICHMOND, San Diego Consolidated Gas & Electric Company, San Diego

Ordinarily the routine testing of arc circuits by the operators at the stations from which emanate the circuits is fraught with a certain element of danger to those who either normally or accidentally might be in the immediate vicinity of such a circuit at the moment of its testing. This is due to the high voltage sometimes used for this testing purpose and the potential power behind that voltage.

A portable, safe, convenient and effective circuit tester is used by the San Diego Consolidated Gas & Electric Company. These devices are made in the shops of the company and consist simply of a No. 5007 Ford unit spark coil, a spark gap, single pole snap switch and three ordinary dry cells. The batteries, of course, are connected through the snap switch to the primary terminals of the spark coil. The high-tension terminals of the coil are connected to 5-ft. rubber-insulated leads, one of which has the spark gap in series. Insulated spring clips facilitate attaching the leads to the circuit terminals. A carrying strap enables the set to be transported easily.

The set is used for supplementary tests after ordinary magneto tests have indicated the circuit to be open. A loose lamp, corrosion in a cutout, or a poor contact anywhere in the circuit might introduce into the circuit a re-



Showing simple arc-circuit testing apparatus using small spark coil.

safe to linemen who may be working on the line. In using the set the gap is set as close as possible in order that maximum potential may be imposed across the high-resistance spot in the line. The gap itself is merely to indicate whether or not the current is flowing around through the arc circuit.

The set may be used whenever necessary without the delays incident to ascertaining that all linemen are clear of the line. Its use also saves the patrolling of the lines due to false indications often given by the magneto tester. The apparatus will not close the circuit through a film cutout or through all cases of corrosion sufficiently for low-potential or magneto current to flow subsequent to the test. However, it will give sufficient indication at the spark gap to show whether or not the circuit is in such a condition as to be operative at the normal arc potential. The apparatus described is shown in the accompanying illustration.

<p>CAN YOUR EMPLOYER DEPEND UPON YOU?</p> <p>—to carry out your work without involving danger to his men or machinery?</p> <p>CAN YOUR FELLOWS DEPEND UPON YOU?</p> <p>—not to take needless risks involving other people in accidents?</p> <p>CAN YOUR FAMILY DEPEND UPON YOU?</p> <p>not to injure yourself, or to allow the carelessness of others to injure you?</p> <p>CAN YOU DEPEND UPON YOURSELF?</p> <p>—to foresee and avoid the dangers with which even the simplest action can be accompanied?</p> <p>IF YOUR ANSWER TO EACH OF THESE QUESTIONS IS YES</p> <p>Then you are doing your part towards the prevention of Accidents in these Works</p>
--

A suggested safety placard.

IDEAS FOR THE CONTRACTOR

California Electragists Continue Estimating Study

Second Lesson in Electragist System of Estimating Given to Members of the Southern Division

By C. J. GEISBUSH, Executive Secretary

Teaching the Electragist system of estimating is one of the most important activities of the California Electragists, Southern Division. The first lesson in this work was given at group meetings in the various districts, each person present being supplied with a photostat of the plan showing the electrical layout and a set of the Electragist estimating sheets. Details of this lesson were given in the July 15, 1925, issue of the Journal of Electricity, pp. 62 and 63.

While this first lesson served a very useful purpose in acquainting our membership with the methods used in making the layout of a job, taking quantities of material from a print and converting these quantities into labor, the committee was of the opinion that it would be necessary to carry on this work in a more detailed fashion in future lessons in order to familiarize the membership with the use of the Electragist manual of estimating.

Each member was furnished with a floor plan and elevation of a machine shop drawn to $\frac{1}{8}$ -in. scale. On

this plan appeared the location of all machine foundations, motors, compensators, remote control stations and the location of the main switchboard. No details of individual circuits were given. The feeder schedule shown in Table I also appeared on this plan.

In addition to the plan, the following set of specifications was drawn up to accompany it:

SPECIFICATIONS for ELECTRIC POWER INSTALLATION IN THE MACHINE SHOP for the CALIFORNIA ELECTRAGISTS Southern Division

This contractor shall furnish all labor necessary to install material as shown on the plans or herein specified for the complete power installation.

All work shall be in accordance with the rules and regulations of the Na-

tional Board of Fire Underwriters as of the 1923 Edition.

The work shall consist of installing all conduit, wire, switchboards, compensators, remote-control push buttons, connecting up and testing motors for rotation.

All motors, compensators, push-button stations and clamped supports for mounting compensators will be furnished by owner.

Conduit shall be continuous from switchboard to compensators, compensator to motor, with 4 ft. of flex steel of the same size as conduit for connection at motor. All conduit shall be installed in the floor before concrete is poured, except that no conduit shall be placed in or across machine foundations.

Main service shall be run under floor to rear of building with a vertical riser of 12 ft. above floor line.

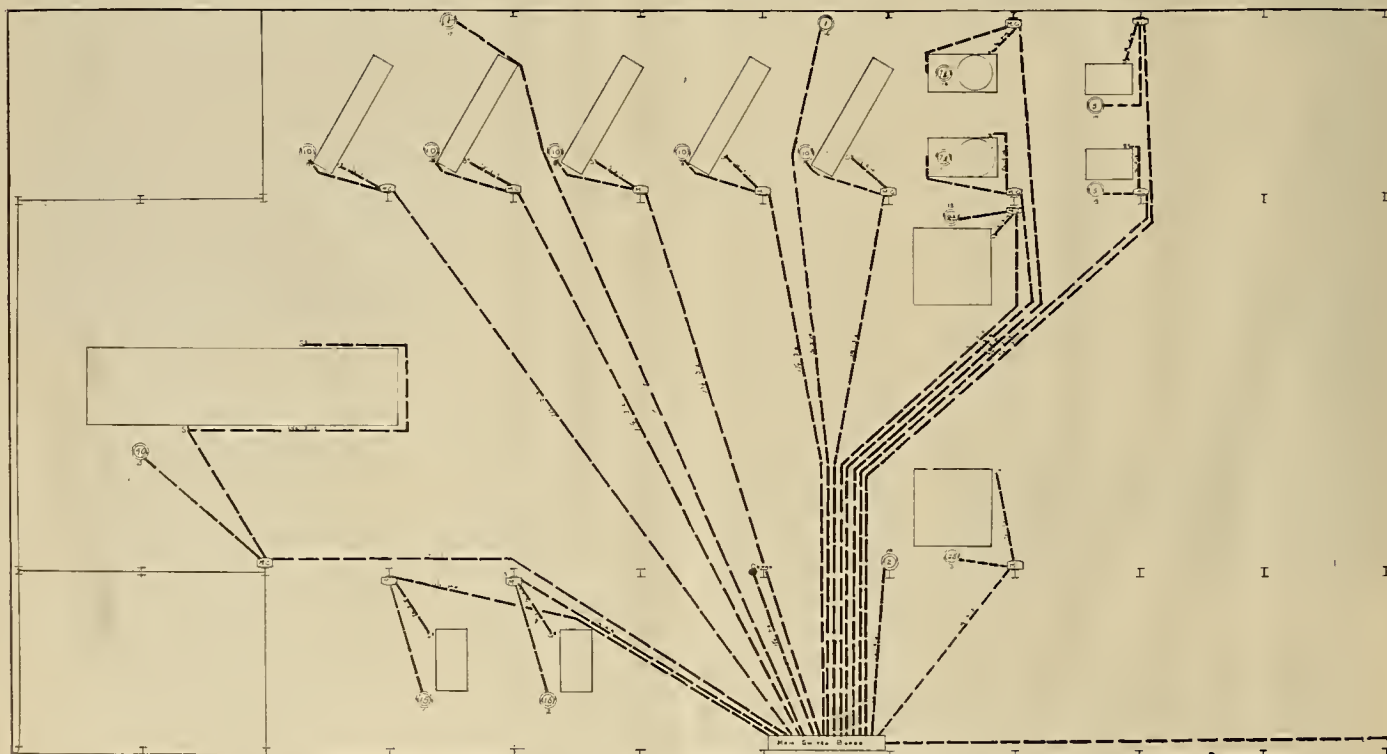
Conduit for compensators, lathes, milling machines, emery wheels and push-button stations shall terminate 4 ft. above floor.

Conduit for punch press shall terminate 8 ft. above floor.

Conduit for crane motor shall terminate at bottom of truss and connection made at crane trolley wires.

Conduit for boring mills, planer and drill press shall terminate at floor line.

Conduit at switchboard shall terminate 6 in. above floor.



Plan of machine shop used in the second lesson in estimating by the California Electragists, Southern Division. This plan shows the job as it was laid out for presentation to the members.

[illegible]

ESTIMATING sheets used by the California Electragists, Southern Division, in the second lesson in the Electragist system of estimating given to the members. Prior to the meeting each member was supplied with a plan and a set of specifications, and at the meeting the job was analyzed carefully by the estimator in charge.

Many very interesting results have been obtained from this second lesson of estimating. After the first few lessons had been completed the instructors decided to try an experiment to test each member as to his knowl-

TABLE I—FEEDER SCHEDULE

The following size conduit, wiring and switches shall be used.

Motor No.	Hp.	Switch (amp.)	Conduit (in.)	Wire size	REMARKS
1	15	100	1 1/4	4	Punch and shear press
2	15	100	1 1/4	4	Punch and shear press
3	25	200	1 1/4	3	Boring mill
4	25	200	1 1/4	3	Crane
5	40	200	2	1/0	96-in. planer
6	10	100	1 1/4	6	Lathe
7	10	100	1 1/4	6	Lathe
8	10	100	1 1/4	6	Lathe
9	10	100	1 1/4	6	Lathe
10	10	100	1 1/4	6	Lathe
11	7 1/2	60	1	8	Radial drill
12	7 1/2	60	1	8	Radial drill
13	5	60	3/4	10	Milling machine
14	5	60	3/4	10	Milling machine
15	20	100	1 1/4	4	Boring mill
16	1	30	1/2	14	Emery wheel
17	1	30	1/2	14	Emery wheel
18	1	30	1/2	14	Emery wheel
Service		600	4	1,000,000 circ.mil	

edge of time required to install one particular part of the job. As the meeting started, those present were requested to write on a piece of paper furnished him the time in man-hours required to prepare and install the three 1,000,000-circ.mil cables used for the main service. It was explained that this would require approximately 320 ft. of wire; that the 4-in. conduit was installed and there were two bends in the run. The wire could be pulled from either the switchboard end or the loading platform. The time allotted for this estimate was approximately 15 min. The estimates were collected to be used later in the meeting.

When the instructor reached that part of the pricing sheet on which was noted the 1,000,000-circ.mil cable he stopped and noted on the blackboard the estimates for this part of the work handed to him earlier in the evening. It was surprising to note that these estimates varied from 4 man-hours to 78. Those present were as genuinely surprised as the instructors and took considerable interest in the detailed explanation of the time required to install the wire. This explanation was given immediately by the instructor, and all members were requested to join in and express themselves as to the time required for the jacking up of the reel, the measuring and cutting of the wire, the fishing of the pipe and the drawing in of the pulling cable, the arrangement of the blocks and tackle necessary for pulling, the connection of the cable to the pulling rope or cable, and at last the actual pulling of the wire. The instructor called attention to the fact that 320 ft. of 1,000,000-circ.mil cable would weigh approximately 1,300 lb. and the reel an additional 200 lb. In every case the time as noted by the members present was very near to that of the Electragist manual of estimating after the instructor had called attention to the many operations necessary for the pulling of such large cable.

This little test was the most effective medium employed in the teaching of the Electragist method of estimating and brought out the fact very clearly that the average contractor, when called upon to figure any large-sized wire, depends upon his memory and thinks of only two classes of jobs: first, the job in which he had no end

of trouble—found his pipe plugged, had his fishing cable break and such kindred annoyances as tend to make even the best of men tear their hair—or, second, the job in which the wire almost fell into the pipe, requiring no particular attention on anybody's part. Of the two it would be better to choose the first because ample time would be given.

A valuable suggestion was received during this second series of lessons from L. C. Baltzelle of the Farley Electric Company, Fullerton, Calif., who uses an ingenious system in connection with the layout. After placing a piece of tracing paper over the blueprint furnished him an outline of the plan was drawn and the location of the various machines was indicated. The detailed electrical layout was made on this. The tracing provided him with an accurate record of the plan furnished him, and this was filed in a rack for this purpose. In an actual job this would enable him to know whether or not any changes were made in the plans after he made his estimate. It also would eliminate the necessity of marking up the plan supplied by an architect or contractor.

It eliminates a great deal of the personal equation in estimating, and anyone may obtain information from this plan without having to depend on the individual who may have made the original estimate. Again, it frequently happens that considerable time elapses between the time of making an estimate and the time of award of the contract. This permanent record enables anyone to know exactly what was figured at the time and just how it was planned to install the various circuits. This contractor has been using this method on a number of installations since that time and finds it to be entirely satisfactory. This extra layout also saves a great deal of time in checking over work at a later date. Wire and conduit sizes, fuse capacity and similar data are available from this and eliminate the necessity of checking up each of these items on the job.

In the discussion of the job at the various district meetings the secretary was assisted by Lee C. Baltzelle of the J. J. Farley Electric Company, Fullerton. Mr. Baltzelle prepared the plan and the large-size layout of the job which is used as the standard in this work, and always has given freely of his time and effort in making this work a success.

As a result of the lessons that have been presented a large number of the members have adopted the Electragist method in all of their estimating.

Cafeteria Installs a Number of Electric Appliances

Food prepared on electric appliances is being featured by the Southern Cafeteria in Bakersfield, Calif. The progressive managers of this cafeteria have found their investment in heavy-duty electric appliances to be well worth while.

The equipment includes a 9-kw. 220-volt Edison griddle, a 4.2-kw. 220-volt waffle iron, and a 5.5-kw. Strite toaster. Provision also has been made for a hotplate for steaks and eggs. The electric installation was made by the Jason Electric Company.



The Southern Cafeteria, Bakersfield, Calif., is featuring food cooked on its electric equipment.

Questions and Answers on the Code and Safety Orders

Arrangements have been made with Claude W. Mitchell, electrical engineer of the Board of Fire Underwriters of the Pacific, to answer through the columns of the Journal of Electricity such questions on the National Electrical Code as are of general interest.

Similar arrangements have been made with George E. Kimball, electrical engineer of the Industrial Accident Commission of the State of California, to answer questions on the Electrical Safety Orders issued by the Commission.

While it is the object of this department to assist in a better understanding of the Code and the Safety Orders, replies given are not to be considered as official interpretations applying in all instances, as some of the rules permit of varying interpretations under different conditions. The questioner should be guided by the inspection department having jurisdiction.

All who are interested are invited to send in their inquiries regarding the National Electrical Code to Claude W. Mitchell, Board of Fire Underwriters of the Pacific, Merchants Exchange Building, San Francisco, Calif., or to the Editor, Journal of Electricity, 883 Mission Street, San Francisco. Questions on the Safety Orders should be sent to George E. Kimball, Industrial Accident Commission, State Building, Civic Center, San Francisco, or to the Editor.

Q. 12. When and where is it permissible to use "loom?"

A. Attention is called to the fact that "loom" is the trade name for flexible tubing manufactured by one firm. Because of the fact that "circular loom" was one of the first, if not the first, to be put on the market, many of the electrical workers still refer to all flexible tubing as "loom."

Reference to the April, 1926, list of inspected electrical appliances issued by the Underwriters' Laboratories shows that under the heading "Tubing, Flexible" there are now seventeen firms manufacturing flexible tubing which meets Laboratories' requirements and bears their label.

In new work flexible tubing should not be used in lieu of porcelain bushings. In an old building or in other places "where it is impracticable to employ insulating supports, the wires, if not exposed to moisture and if operated at a potential not exceeding 300 volts, may be fished if separately encased in approved flexible tubing extending in continuous lengths from one support to the next or to the outlet,

or from one outlet to another; otherwise, approved conduit or approved armored cable shall be used."

At outlets, on some switch legs, at distributing centers, meters, or other places where space is "limited and the 5-in. separation cannot be maintained, each wire shall be encased in a continuous length of approved flexible tubing.

"Vertical wires exposed to mechanical injury on side walls shall be protected by a substantial boxing, extending upward to a point not less than 7 ft. above the floor, said boxing closed at the top by bushed holes through which the wires pass, and providing an air space of 1 in. about the wires. A sleeve of metal pipe may be substituted for the boxing, in which case the insulation of each wire shall be reinforced by approved flexible tubing extending from the insulating support adjacent to one end of the pipe to the insulating support adjacent to the other end."

Flexible tubing shall be used at outlets instead of bushings. "Approved outlet boxes or plates shall be installed at all outlets, and the flexible tubing shall extend from the last knob into and be secured to such boxes or plates."

It is well to note in this connection that the tubing shall be secured to outlet boxes or plates. This requires the use of flexible tubing fasteners. Of these there are nine listed by Underwriters' Laboratories, including two manufactured in San Francisco.

Installation Revised When Hazard Is Realized by Owner

Hazards existing in old electrical installations often are not realized by the owner until an accident occurs. The San Diego Onyx and Marble Works had added to their original installation as the business expended. As the original installation was made some ten or fifteen years ago open knife switches were used. The added load in the plant caused low voltage to be supplied to the motors. A complaint was made to the power company, which sent a man to make tests at the plant. While making tests of the wiring the man received a severe electrical burn, due to the open wiring.

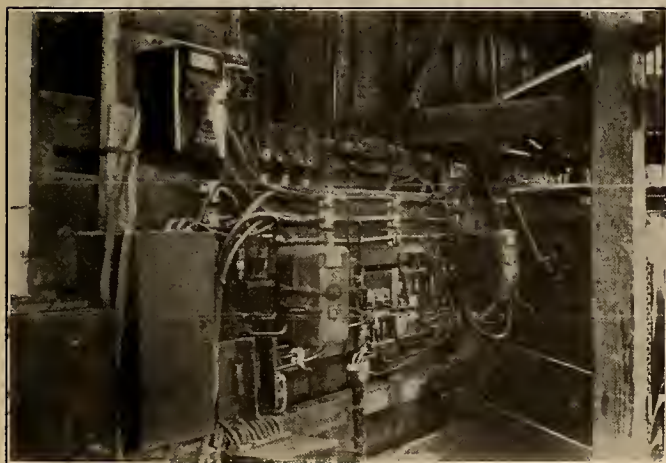
This accident made the owners real-

ize the electrical hazard which existed in their plant. The California Electric Works was called to remedy the condition. After making a survey of the plant, the entire installation was re-wired. Externally operated switches were installed, and all wires were enclosed in conduit or metal troughing. The load was divided into three sub-circuits each individually metered so that accurate cost records might be kept for each department. These were the sawing, flat or polishing and the turning shop.

Conditions similar to this probably exist in many places and will remain so until some accident occurs to call the hazard to the attention of the owners. It is a condition which might be remedied by re-inspection by the electrical department. Re-inspection would be a real service to the owner, the employees and the public.



H. G. Redfern, district manager of the San Joaquin Light & Power Corporation, affixing the Red Seal meter sticker to the home of Mrs. L. C. Temple, Dinuba, Calif. The home is the first Red Seal home in that locality and is a good example of a moderately priced electric home. Mr. Redfern is vice-chairman of the Red Seal campaign in that territory.



The old installation in the San Diego Onyx and Marble Works. Note the open knife switches. The hazard was not realized by the owners until a man was burned while testing for the cause of low voltage.



The revised installation made by the California Electric Works. Externally operated switches and conduit or metal troughing were used throughout. The three meters for cost records may be seen on the right.

BETTER MERCHANDISING

Denver Window Decorator Winner of Over Hundred Prizes

Eugene T. McSpadden, display manager of the Public Service Company of Colorado in Denver, has won more prizes and been accorded more honors in window-trimming contests than any other Western utility company employee. Although only twenty-four years old and without any special training in that line, in the two years he has been in Denver he has received nearly a hundred prizes, mostly cash, and ranging from \$5 to \$75.

He was born in Knoxville, Tenn., and later attended Virginia Polytechnic Institute. His first business appointment was in 1920 with the Amarillo (Texas) City Light and Power Company, one of the Doherty subsidiaries. Later he was transferred to the Bristol Gas & Electric Company, Bristol, Tenn., another Doherty property, and the record he made in window trimming took him back to the Amarillo company and then to Denver in 1924, when the larger commercial program was launched by the Public Service Company of Colorado.

To Mr. McSpadden the credit has been given for the pleasing innovation on the display floor of the company in Denver of the score or more of singing canary birds.

National Association Formed by Radio Jobbers

The Jobbers Radio Association of America, Inc., an organization composed of representative radio wholesalers from all parts of the United

States, was formed at a series of meetings held at the Ambassador Hotel, Atlantic City, May 11-12.

One of the first acts of the Jobbers Association was to begin the construction of a code of ethics designed to correct some of the chaotic conditions now prevalent in the radio industry, with the expectation that, working with existing associations of manufacturers and retailers, the legitimate wholesalers may lend active and forceful aid in the general effort to stabilize the business and assure the public better service and better values in radio merchandise.

The new organization will hold its first annual meeting in New York at the time of the radio shows in September.

Meanwhile it has launched an active campaign to build a strong nationwide membership, restricted to fully qualified wholesalers selected for their high standing and facilities for sound marketing of standard radio products.

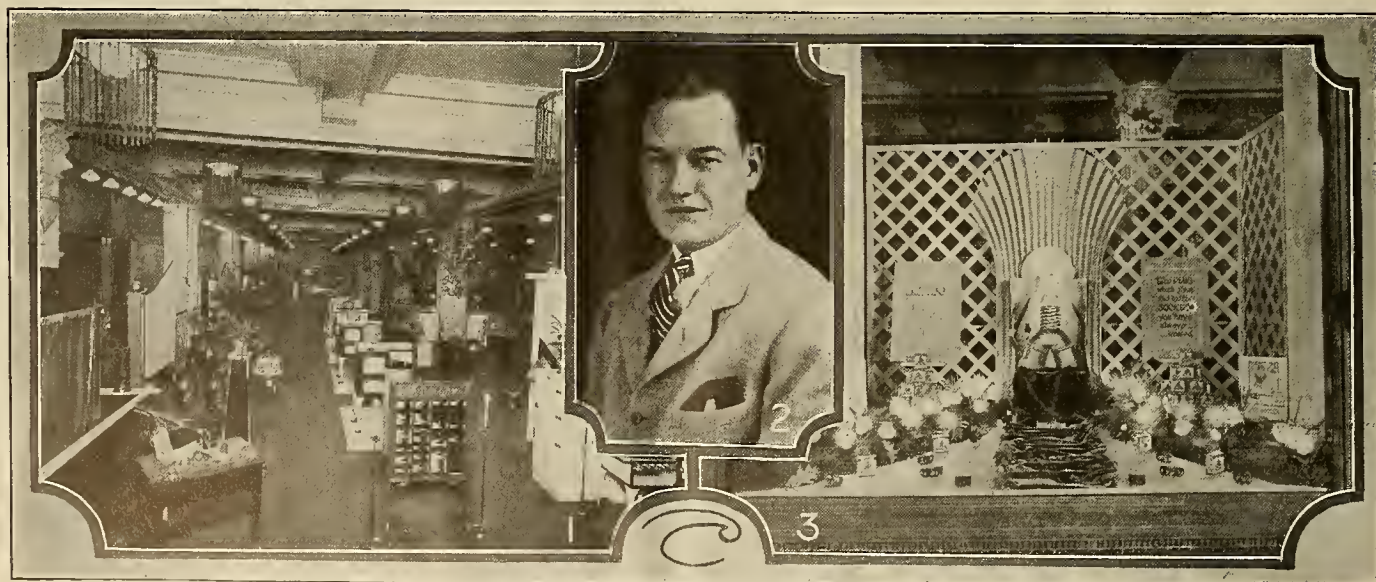
Coast Counties Company's Salesmen Study Electric Refrigeration.—The agents and salesmen of the Coast district of the Coast Counties Gas & Electric Company, Santa Cruz, Calif., recently spent two days in San Francisco in intensive study of electric refrigeration and electric air and water heating. During the session they attended the sales school of the Delco Lighting Company where they were given the latest information on electric refrigeration, and also visited the establishment of the Sandoval Sales Company where the subject of electric air and water heating was discussed thoroughly.

Bureau June-Bride Campaign Gets Response in All Quarters

Response to the California Electrical Bureau's annual June Bride sales campaign this year has been almost unanimous, according to Victor W. Hartley, executive secretary, and indications point to a large number of entries in the contest for the window-display prizes offered by the Bureau.

Pointing to the estimates that there will be over 50,000 weddings in California this year, a large proportion of which will occur in June, and that an average of ten gifts is made to each bride, or a total of 500,000 wedding presents, the Bureau made the suggestion to electrical dealers throughout the state that electrical gifts should constitute a large share of these. Instead of confining the activity with respect to June-Bride sales to one week as heretofore, the Bureau this year urged a full month's activity in appliances of every sort.

To stimulate attractive window displays of electrical merchandise, which should result in increased sales to the dealers using them, the Bureau has offered six prizes for the best decorated windows. The prizes are \$50, \$25, \$20, \$15, \$10 and \$5. Further provision is made that every dealer sending in a photograph of his window display as an entry to the contest shall receive from the Bureau \$1.50 to reimburse him at least in part for the cost of the photograph, whether or not he wins a prize. Photographs of windows are to be sent to the California Electrical Bureau, 447 Sutter Street, San Francisco, not later than July 7.



Winner of over a hundred prizes for window decoration and design, Eugene T. McSpadden (inset), display manager of the Public Service Company of Colorado, recently added to his achievements by innovating a decorative scheme for the merchandising floor of the company using a number of cages of singing canary birds (left). At the right is shown one of Mr. McSpadden's prize-winning windows displaying double convenience plugs.

The Bureau has had printed and is distributing to all dealers in electrical merchandise a large poster to be used as part of window displays. The only provision made in the contest is that this poster is to be included in the window display. These posters are being furnished to dealers without cost.

Advertising assistance, jobber co-operation, and other means of furthering June-Bride electrical gift purchases have been undertaken by the Bureau in connection with the window-display contest.

Correction.—In the advertisement of the Electric Heating & Manufacturing Company carried on page 93 of the May 15 issue of the Journal of Electricity an error appeared. Holmes and Sanborn were the consulting engineers for the builders of the Asbury Apartments in Los Angeles and had complete charge of the engineering work on that building, and it was, therefore, under their supervision that Apfel's systems of electric heating were installed in the Asbury Apartments.

Electragists Report Large Load Increases on Appliances

"To those who feel that the electrical dealer is not doing a good job in the sale of electrical appliances it might be interesting to note," says a recent bulletin issued by the California Electragists, Southern Division, "that our members sold 1,473,109 watts of electrical appliances since the first day of last November as evidenced by the following summary of wattage reports which have been turned in to this office:

Month	Reports	Wattage	Specials	Wattage
November	11	93,038	2	2,000
December	13	404,870	3	11,200
January	29	348,000	74	48,000
February	27	205,000	160	89,000
March	24	213,050	99	54,310
April	23	205,109	61	28,600

These sales, the report goes on to show, represent only one-quarter of the membership. The "specials" re-

ferred to in the table represent the number of appliances upon which a monthly special sales effort was being made and which were reported sold, and the wattage represented by these specials. Members of the Electragists are being urged by the officers of the organization to return cards to them with reports each month as to appliance sales. It is pointed out that the importance of the electrical dealer in the building up of central-station load may be shown better by these reports of actual sales and results.

Kelvinator Representative Tells Refrigerator Sales Policy

Too late to be included in the list of statements of representatives of electric-refrigerator companies in the special number of the Journal of Electricity devoted largely to refrigeration (Journal of Electricity, April 15, 1926, p. 306), was the statement of the Kelvinator representative, L. D. Robertson, vice-president of the Collins Kelvinator Corporation.

His statement of the Kelvinator policy is as follows:

"We have just started on a plan of

training salesmen and then work them in groups covering such territories as the city of Los Angeles in an intensified manner by dividing the city into zones and one group working each zone. This plan is very similar to that used by washing-machine and vacuum-cleaner concerns.

"We have a plan whereby electrical dealers can take orders for Kelvinators, their only investment being one sample. The dealer working under that plan turns his orders over to us and we install and service the machines which he sells.

"The Kelvinator Corporation does the national advertising and it is up to each local distributor and dealer to do his own advertising.

"The Southern California Edison Company is selling Kelvinators through its offices and we have one man who spends most of his time covering its offices and co-operating with them in every possible way.

"The Ontario Power Company also handles Kelvinators, but as it handles only Kelvinators and acts as our dealer exclusively, it is on the regular dealer's basis, working its own salesmen."

Tests Demonstrate Electric Heating Is Economical

Records Taken for Typical Residences in Seattle Show
Electric Bills Comparable to Other Fuel Costs

That electric heating is economical is given further proof in the accompanying table showing the cost of electric service for ten typical residences in Seattle. The data were compiled by P. F. Apfel, president of the Electric Heating & Manufacturing Company of Seattle, which is doing a good deal in the way of pioneering electric air-heating for residences and apartment houses.

The figures given show results in ten typical Seattle homes for the period of a year. All conditions affecting the cost of services are considered in the analysis—the number of rooms, number of stories to the house, the number of registers installed, the

heating load for the house, whether an electric range or water heater is used, whether or not a separate meter is used for heating load, what other appliances are used, and the number of light outlets in the home. Monthly bills for each month for a year then are enumerated, with the average bill given at the bottom of the table. Each of the bills represents, therefore, lighting, heating and cooking.

In commenting on the figures Mr. Apfel concluded, "We have many other residence in process of completion at the present time and we think it is high time that the electrical industry itself should be sold on electric heating."

Records of Electricity Costs in Ten Typical Seattle Residences Equipped with Electric Air-Heating

House No.	A	B	C	D	E	F	G	H	I	J
Number of Rooms	3	3	3	5	5	5	7	7	7	7
Number of Stories	1	1	1	1	1	1	2	2	2	2
Number of Registers	4	4	5	7	7	7	13	17	13	12
Heating Load	8kw.	8kw.	9kw.	17kw.	17kw.	18kw.	26kw.	29kw.	28kw.	24kw.
Electric Range	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Electric Water Heater	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
On Meter	no	no	no	no	no	no	no	no	no	no
Vacuum Sweeper	yes	yes	no	yes	yes	yes	yes	yes	no	yes
Washing Machine	no	yes	no	no	no	no	yes	yes	no	yes
Number of Lights	18	26	16	24	26	28	40	51	40	42

Electric Bills

(Including lighting, heating and cooking.)

House No.	A	B	C	D	E	F	G	H	I	J
February, 1925	14.00	10.50	14.15	26.50	23.50	24.10	25.00	26.30	25.10	27.70
March	11.00	10.00	13.55	16.25	19.65	23.75	22.00	24.30	26.50	28.40
April	5.75	6.50	7.25	11.40	17.30	18.50	16.00	14.70	16.60	18.10
May	3.50	4.75	4.45	7.25	17.75	10.00	10.25	6.30	7.10	10.40
June	3.75	4.60	4.35	5.00	9.70	6.80	5.75	6.30	3.80	8.60
July	4.45	3.25	3.80	4.20	12.10	6.35	6.75	4.20	4.80	7.20
August	4.55	3.00	3.05	3.60	9.00	6.95	7.25	6.00	3.60	5.00
September	6.75	6.75	9.25	12.20	7.65	7.90	9.25	6.80	7.20	7.60
October	5.85	8.40	11.05	13.40	8.50	15.20	18.75	19.00	15.50	23.80
November	12.30	15.00	11.55	19.90	16.50	21.10	29.00	23.80	31.50	25.30
December	11.35	16.50	19.40	27.60	21.25	25.05	26.75	33.60	37.40	33.00
January	12.75	16.00	17.90	25.50	14.10	23.15	29.25	36.80	35.60	28.00
Monthly Average	8.00	8.77	9.97	14.40	14.75	15.74	17.20	17.35	17.89	18.60

Ingenious "Lamp Merchandiser" in Greeley Office

Colorado Utility Believes in Using Plenty of Light in its
New Office and Merchandising Store

Several noteworthy merchandising features are embodied in the new offices, salesroom and depot of the Home Gas & Electric Company at Greeley, Colo., where quarters recently were acquired and remodeled at a cost in excess of \$50,000.

The building comprises a composite plant, housing in one location all departments of a concern that furnishes electricity not only to Greeley's 12,000 persons, but also maintains 100 miles of transmission line serving seven neighboring cities and a miscellany of power users scattered between. It not only meets the present needs as headquarters but provides for future growth.

Opening off the street by a central entrance is the sales floor for merchandise, 50x40 ft., providing 2,000 sq.

some four feet from the floor with oak, with plate glass extending 3 ft. above that height. Everything is open to view. Two openings in the glass comprise stations for the cashiers. Directly in front of the office is a two-sided oak desk similar to that commonly provided in banks for the use of patrons.

Opening to one side of the offices are the vaults and storerooms for records. Adjoining them and accessible from the sales floor are rest rooms for women, with an ornamental drinking fountain just outside the entrance door.

At the other side of the room a wide stairway leads to the second floor. Opening off the landing midway up is the manager's office, built as a mezzanine. It is in full view from

carries 400 watts. The total overhead wattage in the room is 15,800.

Besides these, each pillar in the room carries wall lamps on four sides, while numerous other outlets around the walls and on desks are utilized. The windows, which are 20 ft. wide and 12 ft. deep, contain the entire array of floodlights adaptable to their illumination. The back panels of these windows extend to a height of only 4 ft. It is thus possible for passers-by at night to view the entire room in full illumination. As the ceiling is 16 ft. high and everything is finished in a manner to aid and emphasize reflection of the light, the ensemble picture presented is an impressive one. It goes without saying that the complete and attractive lighting facilities have been and are silent salesmen of great efficiency.

The entire second floor of the building, 50x125 ft., is dedicated to community usage. A partition has been erected 15 ft. from the rear, creating a kitchen, where electric ranges have been installed and connected.

Auditorium a Good-Will Builder

The remainder of the space is set aside as an auditorium suitable for luncheons, banquets, dances and similar social or business gatherings. The management has made it known that the hall is available and that various groups in the cities served are welcome to its use. The only charge is for janitor service. The Chamber of Commerce of Greeley, various of the luncheon clubs and other organizations make use of it for their banquets, while many women's clubs and church groups have utilized it for both day and evening meetings. The company also put it to advantageous use recently when a cooking school was held there. Provision of this auditorium brings hundreds of persons into the building for other than business with the company and fosters a spirit of good-will toward the concern.

The basement is finished completely, giving 6,250 sq. ft. of space there. One section of it is enclosed and is used for merchandise storage, with a separate stairway leading to it from the main floor. The remainder of the room is given over to storage of line supplies and general materials. Everything is kept in its place through a system of bins. Entrance is by a stairway at the rear. An elevator is provided for handling heavy materials.

To the rear of the main building is a concrete garage with a capacity of ten cars. In it are housed all the company's motor equipment, including trucks. Beneath the garage is a modern heating plant which supplies both buildings.

Lamp Merchandiser Is Unique

The electric lamp merchandiser on the sales floor greatly has simplified the work of retailing globes. It is 18 ft. long and 7½ ft. high. At the top in a horizontal line are 27 compartments, each containing a lamp, controlled by a switch below. Each of these compartments is finished inside with black. By switching on the various sizes and types of lamps, the customer can make an instantaneous



A lamp for every compartment and every lamp in its place in this well arranged lamp display and storage cabinet, called a "lamp merchandiser" by its designer, L. R. Storey, of the Home Gas & Electric Company, Greeley, Colo. It has been copied and used by many other merchandisers in Colorado.

ft. of space which permits the most advantageous display of everything from ranges down to the simplest appliance. At either side of the room are wall cases of the finest oak construction. One is a special globe merchandiser, designed by L. R. Storey, superintendent, and since widely copied in the Rocky Mountain states. The other is a brilliantly illuminated, glass-front case for the display of the better class of percolators, grills, waffle irons and similar appliances. Ranging between the two walls are miscellaneous tables, each devoted to a particular class of merchandise, while here and there over the floor are refrigerators, ranges, vacuum cleaners, floor lamps, and similar electrical appliances.

The offices occupy the center of the room, the enclosure being built up

the floor and from it everything below can be seen. Back of the general offices on the main floor is the superintendent's office, while the meter-testing department occupies a corner in the rear of the room.

Takes its Own Medicine

This brings the account to mention of the lighting facilities. Here is one electric company that makes liberal use of the principal commodity it sells, furnishing a glowing example for the community to follow. Four rows of red, green and natural lamps extend along the ceiling from one end of the room to the other, the rows being equi-spaced. They contain a total of 520 lamps, each of 15 watts. In addition to these, 20 ornamental hanging fixtures of Ivanhoe silver tassel design are distributed over the room. Each

comparison and choose the one wanted. It is possible to demonstrate simultaneously or individually at an instant's notice all types of lamps carried.

Beneath these demonstration recesses are compartments for storage of the corresponding lamps, all of which are immediately available by opening hinged doors. The bottom 3 ft. of the case is divided off for carton storage of reserve stock, from which the shelf stock above is replenished as needed. Company officials state that one girl handling lamp sales can do the same amount of work as formerly in half the time. Customers are aided materially in getting exactly the lamp they want.

Mr. Storey, designer of the cabinet, has made no effort to protect his rights. Plans have been passed along freely to other companies, and several in Colorado and neighboring states are now using cases built on the plans prepared at Greeley. Because of its oak construction and fine finish to harmonize with the rest of the woodwork, the Greeley model cost \$600 to build. Cases of soft wood have been prepared for other offices for less than half this amount.

May Be Built in Sections

It is possible to build such a case in sections, making it applicable to use in any size of community, adding or eliminating sections as desired. With the new standardization of lamps in effect, the size of the case

will be reduced materially and the cost cut proportionately.

The Home Gas & Electric Company retails power purchased from the Public Service Company of Colorado. It is a Greeley concern, with 150 stockholders. It does not furnish gas to the community, the title of the company retaining the word "gas" from bygone years.

Fred Norcross is manager of the concern, having been with it for a number of years. He has built it to a successful financial enterprise which gives excellent service. Mr. Norcross is allied with various public movements in Greeley and is a leader in the community. At present he is president of the Chamber of Commerce. Among his other duties is that of Boy Scout leader, and half a dozen drums in the assembly room of the company attest to the fact.

The Greeley company, in addition to serving the usual domestic and municipal demands for current, carries a load of 4,000 hp. on pumping plants for five months in the year during irrigation season. Learning that there is a strong underflow of water through many parts of the county, the farmers have installed motor equipment. The power factor is boosted to a desirable point by using synchronous machines.

The outlying cities furnished by the company are La Salle, Kersey, Eaton, Ault, Pierce, Nunn and Evans, all of which lie within a circle of a 10-mile radius, of which Greeley is the center.

Results from Merchandising Institute Lectures

McNally Company, Pasadena, Improves Windows as Result of Electragist Talks on Window Display

More than ten electrical contractor-dealers have changed and remodeled the windows of their stores as a result of the talks given on store-window display at the institutes held by the merchandising section, California Electragists, Southern Division. Better

technique in window display, too, has been noted in each instance.

The success of the first institute has encouraged the merchandising section to plan and set in motion a second institute, conducted on similar lines to the previous one. (See Journal of

Electricity, March 15, 1926, p. 231.) For this second institute it was planned to have Mr. Graham of the Chicago Flexible Shaft Company deal with the subject of selling socket appliances, and R. E. Smith, advertising manager, Southern California Edison Company, with dealer advertising methods and practice. This institute started in May and is to continue until meetings have been held in each of the centers of population of the southern part of the state.

One notable instance of dealer window improvement as a result of the last institute was that of the McNally Company of Pasadena. The previous arrangement of windows at this establishment was unsatisfactory.

The windows provided no back wall so that the attention of passersby was distracted from the window contents by a view of the interior of the store. The darkness of the interior by contrast gave the windows a mirror effect, cutting down their effectiveness.

Since remodeling, with a curtain background, attention is concentrated upon the merchandise on display. And the best part of the change was that it was made at comparatively little expense.

The curtain background was made of monks cloth, which presented a neutral tan background. An attractive border, made of orange velour and black silk fringe, was run along top and bottom of the curtain drape. On the reverse side borders of apricot-colored velour with gold fringe made it possible by turning the curtains around to get an entirely new effect. By varying the background thus in the two windows an effect of novelty was not difficult to obtain.

Window lighting in the McNally window also was improved upon advice from the institute. The 35 sq.ft. of space in each window now is lighted by three 200-watt units, one of which is a diffusing unit, one a spotlight, and one a daylight lamp with an angle-type reflector concealed in a lantern which hides it and prevents any glare from the street.

Several transparency signs which were on the window glass and obstructing the view have been removed, and more are to be removed later. In the interior all shelf goods have been installed in glass show cases. A large case, containing 50 compartments, takes care of all the shelf goods, affording each appliance attractive display space of its own.

Edison Company Announces Commercial Department Personnel Changes.

The following changes in the personnel of its commercial department have been announced by the Southern California Edison Company: P. S. Minner, Inglewood district manager, has requested an extended leave of absence because of ill health. R. C. McFadden, Oxnard district manager, has been transferred to take charge of the Inglewood office, and H. A. Brody, Lindsay district manager, will replace Mr. McFadden at Oxnard. Carl Elgan, who has been assistant district manager in Pasadena, has been transferred to take Mr. Brody's place. H. S. Williamson of San Bernardino has been transferred to the Redlands district, and H. J. Moulton, Redlands district manager, will succeed Mr. Williamson at San Bernardino.



Attractive yet simple arrangement of window of W. A. McNally Company of Pasadena as improved after window display institute talk.

NEWS OF THE INDUSTRY

Cushman Plant of Tacoma Formally Opened in Celebration; File for Next Unit

In the midst of much pomp and ceremony, involving President Coolidge in the pressing of the key which opened the plant, army airplanes in aerial salutes, christening of the towers across The Narrows, and speeches from prominent advocates of municipal projects, the Cushman plant of the City of Tacoma was opened formally on May 24. Tests of the plant had been completed, however, some days before and power from the Cushman plant had been sent to Tacoma occasionally from the new units before the formal opening of the plant.

Simultaneously with the opening of Cushman plant, filings were made by the City of Tacoma with R. K. Tiffany, state supervisor of hydraulics, for a second unit of the development on the Skokomish River.

It was on March 23, 1926, one week after the preliminary celebration heralding the approach of Cushman power, that one of the 25,000-hp. units in the new Cushman plant of the City of Tacoma was synchronized on the line and its load built up approximately to 12,000 kw. Both units had been for some days in the process of being dried out and tested by the project engineers and manufacturers' representatives. This process continued until the plant was turned over to Ira S. Davisson, commissioner of light and water, and Llewellyn Evans, superintendent of the light department, to operate after the ceremony on May 24.

The project, in the development of which the two 25,000-hp. units installed in power house No. 1 constitute the first step, derives its name from former Lake Cushman, which lay in the gorge of the north fork of the

Skokomish River in the foothills of the Olympic Mountains, some fifty miles northwest of Tacoma. At a narrow point in the gorge about four miles below the lake a constant-angle, concrete, arch dam, 265 ft. high, creates a storage basin $8\frac{1}{2}$ miles long and 1 mile wide, impounding 450,000 acre-ft. of water and submerging the old Lake Cushman beneath 170 ft. of new and larger lake.

The water-wheel-generator units consist of two 27,500-hp. Allis-Chalmers, vertical turbines direct-connected to two 20,000-kva., 13,200-volt, 200-r.p.m. generators.

The dam, tunnels and power house were constructed under contract by A. Guthrie & Company, Portland.

From the switchyard to the terminal substation in Tacoma a double-circuit, 110-kv. transmission line follows a direct route a distance of 44 miles. Except for three water crossings, and for that portion of the line running through the city limits, the circuits are supported on separate wood-pole towers running parallel through a cleared right-of-way 100 ft. wide. The steel for The Narrows towers was supplied and erected under contract with the Star Iron Works, Tacoma.

The present transmission circuits from power house No. 1 terminate at the Cushman substation, North 21st and Washington Streets, Tacoma. This station is designed to handle the entire output of the complete development, but for the present has installed transformation and control equipment only for that part of the development completed to date.

The transformers and condenser are of Allis-Chalmers manufacture; the

110-kv., 50-kv., and 13.2-kv. circuit breakers were supplied by the General Electric Company, while the Westinghouse Electric & Manufacturing Company furnished the switchboards, metering equipment and disconnecting switches. A Westinghouse carrier-current communication system connects the power house and the substations.

A second and third step, each designed to add 45,000 hp. to the present installed capacity, are planned as a later development in the project. This will make complete use of the 475-ft. hydraulic head between tailwater of the present plant and tidewater. A 180-ft. dam near Potlatch below the present power house No. 1 will raise the water level to that of the present tailwater. A concrete-lined tunnel some two and a half miles long then will deliver this water to a forebay at the same level from where it will be carried by steel penstocks down to two 45,000-hp. units in power house No. 2, situated at tidewater on the shore of Hood Canal directly below the forebay.

The Cushman development was built mainly by contract on the design and under supervision of the city's project engineers. J. L. Stannard was chief engineer, A. F. Darland was responsible for the electrical features, J. V. Gongwer for mechanical and structural design and B. E. Torpen for design and construction of the dam and tunnels.

The new filings on this project now seek the appropriation of 600 sec.ft. of water from the South Fork of the Skokomish River. The dam across the South Fork, according to the proposal, will be of concrete, 285 ft. high, 500 ft. long across the top, and will cost approximately \$1,500,000. It is designed to deliver additional water through a 4-mile tunnel into the present reservoir. The estimated total cost of the new undertaking is \$7,500,000.



View of Cushman power plant in course of construction.

Pacific Coast Division Wins Third Prize in Contest

A. M. Frost, San Joaquin Light & Power Corporation, chairman of the Pacific Coast geographic division of the Industrial Lighting Activity, was awarded third prize as geographic chairman at the national convention of the N.E.L.A. recently in the contest held in connection with the Industrial Lighting campaign.

In spite of the fact that the Pacific Coast is not regarded as an industrial empire, the showing made in the Industrial Lighting campaign in California, Nevada, Arizona and Hawaii was such that the district was awarded third prize in the national contest, it was stated. The work was divided into two parts, the first that under the supervision of the educational committee, with Clark Baker, National Lamp Works, as chairman, and the

second the sales work in charge of the various vice-chairmen.

Preliminary campaign meetings were held to educate contractor-dealer and power-company representatives to the benefits to be derived from the activity, methods for figuring lighting layouts, and methods of demonstrating the value of good light to industry.

Blank prospect cards were given to contractor-dealers upon which prospects were to be listed. These prospects were worked on by both dealers and power-company men. Direct-mail broadsides and letters were used as sales-promotion material. Co-operation was given by manufacturers and jobbers. The playlet, "What Price Light," secured audiences for the idea of better industrial lighting and proved an effective means of publicity.

Vice-chairmen in charge of the work under Mr. Frost in each district were as follows: R. V. Sanford, Tucson Gas, Electric Light & Power Company, for Arizona; O. S. Clifford,

Truckee River Power Company, for Nevada; J. F. Fenwick, Hawaiian Electric Company, for Hawaii; and C. D. Monteth, Pacific Gas and Electric Company; H. H. Allison, Great Western Power Company; R. C. Bragg, Vallejo Electric Light & Power Company; H. K. Griffin and G. A. Ferguson, Western States Gas & Electric Company; M. L. Foster, Coast Counties Gas & Electric Company; P. S. George, Coast Valleys Gas & Electric Company; Frank Weiss, Los Angeles Gas & Electric Corporation; C. M. Masson, Southern California Edison Company; W. R. Chawner, The Southern Sierras Power Company; G. D. Smith, Ontario Power Company; G. H. P. Dellmann, San Diego Consolidated Gas & Electric Company; and C. B. Merrick, San Joaquin Light & Power Corporation, for California.

The educational committee under Clark Baker, chairman, consisted of: D. Pence, Illinois Electric Company; C. O. Martin, Benjamin Electric & Manufacturing Company; F. Van Gillewe, C. W. Cole & Company; R. S. Prussia, Westinghouse Lamp Company; C. A. Sanborn, Holmes & Sanborn; M. Hixson, Edison Lamp Works; T. F. McDonough, Benjamin Electric & Manufacturing Company; H. C. Barnard, Curtis Lighting, Inc. of California; W. A. Alden, Westinghouse Electric & Manufacturing Company; Leo Gianini, Edison Lamp Works; H. H. Robinson, Pacific Gas and Electric Company; and L. A. Hobbs, Edwin F. Guth Company.

Stanford to Make Electrical Course a Six-Year Course with New Ryan Laboratory

The course in electrical and other branches of engineering at Stanford University hereafter will consist of six years' work, divided into a four-year undergraduate period and two years of graduate work. Dr. Harris J. Ryan will continue to be dean of the electrical engineering department, with Theodore J. Hoover dean of the school of engineering.

The initiation of the new training scheme was marked by the recent completion of the building to house the Ryan Electric Laboratory and arrival of six transformer sets capable of developing 2,100,000 volts, single-phase, that now are being installed in the laboratory. Dr. Ryan, Clyde A. Binns, local representative of the General Electric Company, donors of the \$117,000 apparatus to Stanford; and Associate Prof. H. H. Henline received the equipment at the end of its journey from Pittsfield, Mass.

For some years the idea of consolidating the engineering branches at Stanford had been discussed as part

of the general tendency to organize the university into a series of schools. It met with considerable favor from the first. Following the recommendations of a committee appointed to consider the matter, the school now has been organized.

"This development of engineering education at Stanford and the look into the future implied therein," said Dean Hoover to a representative of the Journal of Electricity, "is based on a conception of the engineer and engineering as something vastly greater and more significant in modern life than just a man with a technical training and a sort of profession in which technology is the main ingredient.

"The engineer today, and much more so in the future, is and must be the man who controls the forces of nature and utilizes the material resources of the earth, and who organizes and directs human activities on these lines for the benefit of the race.

"As the stupendous total of our material assets constantly increases in

bulk, and as man's environment comes more and more under his control, the engineer with each succeeding generation must take upon his shoulders larger and larger portions of the burdens of civilization. If engineers of the future are to justify their name and fame and the effort and expense put into their creation, there must be an improvement in their participation in public affairs; their sense of their public obligations must be further aroused, and a surer knowledge must be acquired of how to make their efforts effective.

"In working out the details of the School of Engineering at Stanford, it has been definitely decided that the four-year curriculum cannot be utilized for a professional training, hence the school has been placed on a six-year basis."

It also has been recognized that education in electrical engineering generally has suffered from too great specialization, according to Dean Hoover, to the detriment of fundamentals. It is this that the new school hopes to avoid.

By this move the degree of Bachelor of Arts in electrical engineering has been abolished. Hereafter the preliminary degree will be the Bachelor of Arts in engineering. After specializing during two graduate years, the degree of Electrical Engineer will be awarded.

Stanford's most important work will be carried out in the Ryan Electrical Laboratory, now complete. In this Dr. Ryan hopes to continue and expand his researches into high-voltage phenomena. As the Journal of Electricity of Sept. 1, 1925, p. 167, announced, the new laboratory is located south of the university, between Pine Hill and the Mayfield reservoir hill. The building is 173 ft. long, and its width 80 ft. The roof is supported on trusses to leave the interior free of supporting columns. The height from the concrete floor to the underside of the trusses is 50 ft. For safety to life and equipment, 20-ft. clearances have been provided everywhere around the main electrodes and corresponding points of application of the voltages to avoid discharges or destructive arc-overs.

Application to Issue Securities Approved by Commission

The application of the Southern California Edison Company to issue \$40,000,000 of 5-per-cent refunding mortgage bonds and \$10,000,000 of series "B" 6-per-cent preferred stock has been granted by the California Railroad Commission. The company's general and refunding 6-per-cent bonds, due in 1944, will be called at 105 under the plan, and the balance of the funds from the sale of the securities will be used to reimburse the treasury for expenditures made for extensions and additions to its properties.

Announcement that the company's application to list its common stock on the New York Stock Exchange has been granted was made May 26, 1926. Listing on that exchange will give to the stock the nation-wide distribution that a stock of its rating warrants. It is believed that such standard proven stock, paying regular dividends, should have this advantage for greater stability.



Two-million-volt transformer set for the new Ryan Laboratory at Stanford University being received by Dr. Ryan for the University from the General Electric Company. Left to right are Clyde A. Binns, representing the General Electric Company; Dr. Harris J. Ryan, Joseph S. Carroll, and Associate Prof. H. H. Henline.

Pouring of Concrete Started on Horse Mesa Dam

Actual work on the pouring of concrete has been started on the foundation of the Horse Mesa power dam being constructed on the Salt River by the Salt River Valley Water Users' Association, seventeen miles below Roosevelt, Ariz. In preparing for the dam bedrock, 34 ft. below stream level, has been cleaned thoroughly and then reinforced for an added depth of 50 ft. by the injection of Portland cement under heavy pressure in a large number of holes drilled at frequent intervals. This precaution is expected to close any possible fissures and insure against leakage. This preparatory work has occupied almost two years. The cement is mixed in two great mixers high on the canyon wall and dropped by gravity to the pit below. Gravel and sand are brought to the work by dredging barges hauled by tugboats.

The new structure will be 32 ft. higher than that at Roosevelt, rising 312 ft. from bedrock. It is to be of monolithic type, with an ample factor of safety. Including the electrical equipment, the estimated cost of the work will approximate \$4,800,000. Work is being done directly by the association under its own engineering plans. There are 300 men now employed and it is expected to continue the work through the summer months even though conditions are very trying due to the excessive heat. It is expected that the dam will be completed in twelve months.

No Action on Boulder Dam at This Session Possible

All probability of advancing further the Boulder Dam legislation at this session of Congress vanished when the House committee on irrigation and reclamation voted to table the revised Swing-Johnson Bill. The so-called power amendments prepared by Representative Leatherwood of Utah were withheld until the time should be more propitious for their formal presentation.

The irrigation committee devoted practically all of its time at this session of Congress to the consideration of the Boulder Dam question. Finally it became clear that no agreement could be reached. This led Representative Hayden of Arizona to offer the motion to table. The vote on the motion was nine to six. Representative Leatherwood and Representative Allen, of Illinois, Republicans, joined with the seven Democratic members of the committee in supporting the Hayden motion. Those voting against the motion were: Chairman Smith of Idaho; Swing of California; Leavitt of Montana; Arentz of Nevada; Winter of Wyoming, and Davenport of New York.

Senator Johnson of California is planning to make a speech on the subject and an effort may be made to bring the bill to a vote in the Senate. It is not believed, however, that it can be passed, despite the fact it is on the calendar with a favorable report.

It is expected that some new plan will be brought forward at the next session. This may take the form of a proposal for the construction of a project by a public corporation which

would construct and operate the dam and power house but would sell the output to the highest bidder.

Cowlitz Development Announced by Federal Company

Completing the purchase of land and floodage rights on the Cowlitz River, Wash., W. W. Briggs, vice-president and general manager, Gray's Harbor Railway & Light Company, Aberdeen, Wash., acting for the Federal Light & Traction Company, has announced that the way is paved for an extensive hydroelectric development which will be undertaken immediately. (Journal of Electricity, Jan. 1, 1926, p. 31.) The first unit, to develop 49,000 kw. at a cost of about \$6,500,000, will be situated near Mayfield about twenty-five miles southeast of Chehalis. This portion of the development will require a dam 155 to 185 ft. high. Floodage rights extend up the Cowlitz River into Young's Canyon north of Mossy Rock. A second and third step in the complete development now contemplated will produce a total of 166,000 kw. at an estimated cost of \$22,000,000.

By controlling the land and floodage rights on the river the Federal Light & Traction Company holds the upper hand in the conflict still in progress for permit to develop the Mayfield site and others. Principals in this contest are the Federal interests and Backus-Brooks interests of Minneapolis, who proposed an industrial development in connection with the power project. R. K. Tiffany, state supervisor of hydraulics, Olympia, last January issued a permit to C. C. Garland, Tacoma, representing Backus-Brooks (Journal of Electricity, Feb. 1, 1926, p. 112), but an appeal was taken to the Superior Court of Lewis County by H. W. Crozier, engineer, representing the Federal company. This contest, as yet undecided legally, now is expected to be settled amicably as a result of the present announcement.

New Licenses Issued by Federal Power Commission

Licenses and permits granted recently by the Federal Power Commission include: A license to the Northwestern Power & Light Company of San Francisco, covering a development on the Elwha River in Clallam County, Wash. The plans call for a concrete arch dam 195 ft. in height, a tunnel 530 ft. long, and the installation of 12,000 kw. Power is to be fed into the company's existing system. The reservoir will provide 20,000 acre-ft. storage.

A license to the Inland Power & Light Company, of Portland, Ore., covering a project on Clearwater River near Lewiston, Idaho. The installation is to be of 10,000 kw. Full details of the project were published in the Journal of Electricity June 1, 1926, p. 547.

A license to the Livingston Mines Corporation pursuant to rights acquired by the late J. E. Walker. The project is on Big Boulder Creek in Custer County, Idaho.

A preliminary permit to Giffen, Porter, Pearsall, Freeman and Knapp, of Los Angeles. The project involved is on the North Fork of the Trinity River and the East Fork of that stream. The power is intended for use in mining operations.

A similar permit to Knight, Kay, Stone, Hall, Breeden and Wilson, of Eureka, Calif., covering a project on New River in Trinity County.

Edison Company Acquires Land Adjoining Laguna Bell Substation.—Thirty-five acres of land adjoining the Laguna Bell substation have been acquired by the Southern California Edison Company, Los Angeles, it is reported. The property is said to have been purchased in connection with the extension of the Laguna Bell substation.

Southern California Edison Company

has over

85,000 STOCKHOLDERS

In 1917
Southern California
Edison Company
had 1,800 Stockholders

This picture represents the number of stockholders
in the Southern California Edison Company.

In 1920
Southern California
Edison Company
had 8,000 Stockholders

*Safe Investment—
Easy Savings Plan*

**16,000 Workers are buying
EDISON STOCK**
on our savings plan
Why not join them?

*Business Partnership—
Good Return*

Attempting to picture for the public the tremendous numbers to which its stockholder list has attained, the Southern California Edison Company uses this layout and these captions in the windows of its various offices. The original is 5 ft. long and 3 ft. 6 in. high. Busy Buttons on the left is pointing to an insignificant group of approximately 1,800 spectators in the stands at the 1925 Stanford-U.S.C. football contest as representing the number of Edison stockholders in 1917. On the right a considerably larger group, approximately 8,000, is pointed to by Busy Buttons as the number of stockholders on the company's books in 1920. The center caption then completes the story by stating that the entire number of people pictured in the stadium, 85,000, represents the number of stockholders of the Southern California Edison Company today.

Balch Tunnel East End Completed; Kings River Project Rights Granted

The east end of Balch tunnel, a part of the San Joaquin Light & Power Corporation's Kings River hydroelectric power development, recently was completed when drillers broke through the rock at the intake, according to a report issued by Harold K. Fox, chief construction engineer.

Work has been in progress on the tunnel since last September when 175 men began operations at three points on 19,500 ft. of a 12 x 12 bore to carry water from the North Fork of Kings River to Balch power house where 40,000 hp. will be developed. By working in two directions from adits or side tunnels driven into the main tunnel line, it has been possible to drive the tunnel from five breasts or headings. The completed section, which extends east 2,000 ft. from Black Rock adit will be finished with steel intake gates controlling the flow of water into the tunnel.

A total of 12,500 ft. of tunnel has been driven to date, leaving 7,000 ft. to be completed, while the power house and penstock line are in course of construction. Approximately one million pounds of high explosives are being used in the work. Foundations to carry the penstock line are nearing completion to be in readiness to carry the big high-pressure pipe. The pipe will measure 60 in. in diameter at the tunnel and taper in size to 48 in. when it will be divided into two lines of 34 in. each. The penstock line will be 4,854 ft. long and will pass under the river before entering the power house.

Six camps have been constructed to house the 450 men now at work on the Balch development, while this number will be increased this summer to approximately 700 during the peak construction period in October and November. The original plans called for completion of the Balch plant by Jan. 1, 1927, but the progress of the work has been so satisfactory it is said that

the plant will be completed 30 days earlier.

Full details of the Balch plant which is estimated to cost \$4,850,000, were published in the Journal of Electricity April 1, 1925, p. 241.

In connection with the Kings River development project the San Joaquin Light & Power Corporation recently has been granted by the California Division of Water Rights four permits for the diversion of water from the North Fork of the Kings River, Helms Creek, Racheria Creek and certain small tributaries. The permits call for a generation of a total of 232,613 theoretical horsepower involving the estimated expenditure of \$42,300,000 in the construction of additional power houses and enlargement of power plants now under construction.

Storage also was applied for in some of the applications filed by the corporation, but approval of storage features has been withheld for the protection of agricultural interests in view of the great variability of the flow of the Kings River. (Journal of Electricity, Jan. 1, 1926, p. 28.) The permit directs that the flow of the river shall be maintained at all times so that it will be at substantially the same rate as if the diversion and contemplated use were not availed of.

New 15,000-kw. Steam Unit for Pasadena Recommended

Construction of a 15,000-kw. steam generating unit for the Municipal Light and Power Department of Pasadena, Calif., is recommended in the budget for 1927 which has just been filed by Benjamin F. Delanty, general manager. The plant addition will cost \$750,000, including the turbine, a 1,000-hp. boiler, condenser and necessary fittings. Mr. Delanty has estimated that the plant will cost \$50 per kw.

New meters are being installed at

the rate of 2,000 per year, which makes it necessary to increase the capacity of the present plant. In his recommendations Mr. Delanty urges that the new addition be ordered early in 1927 and, as it will require nine or ten months to make and install the equipment, at least 18 months must elapse before the unit will be ready for operation. The present plant has a capacity of 18,000 kw.

The recommendations also include the rebuilding of the Lamanda Park substation. This station is in a rapidly growing section of the city and is carrying a capacity load of 3,000 kw. at the present time, which makes it essential that provision for handling this growing load be made immediately.

Cities' Application for Water Rights Before Commission

Favorable action by the Federal Power Commission on the application of the East Bay cities for rights on the Mokelumne River in California (Journal of Electricity, May 15, 1926, p. 491), is foreshadowed by the receipt of a favorable report on the project from the engineers who made the field examination. The principal purpose of the project is to provide storage for the municipal water supply, but a power development of 12,000 hp. is planned also.

Objections to the project have been filed by the California Reclamation Board and land-owners in the delta of the Sacramento River. The Reclamation Board is insisting that the Lancha Plana reservoir should be adapted to flood control. No engineering data to support this contention, however, have been received.

The farmers on the lower Sacramento fear further encroachment of salt water on their lands if the flow of fresh water is reduced. The amount diverted, however, is regarded by the engineers as insufficient to have any bearing on the salt-water situation.

New Wynooche Project Estimate Is Set at \$2,000,000

In a report to the city council of Aberdeen, Wash., on the Wynooche power project which the city proposed to develop, W. J. Roberts, consulting engineer of Tacoma, Wash., places an estimate of \$2,000,000 as the probable cost of such an enterprise. He claims this amount will develop between 12,000 and 15,000 hp. He states that the Weatherwax storage basin at an elevation of 700 ft. has storage capacity of 200,000 acre-ft., and to effect this storage a dam approximately 240 ft. in height would be required. The basin would cover about 2,600 acres.

Mr. Roberts was employed by the city council to make a report on the Wynooche project after the findings of Stevens & Koon, consulting engineers of Portland, had been rejected by that body. (Journal of Electricity, May 15, p. 493.)

An ordinance proposing the issuance of \$2,000,000 in bonds for the development of the Wynooche project has been passed by the city council. June 29, 1926, is the date set for a special election at which the people will have the opportunity to express themselves for or against the project.



Starting the first adit of the Balch tunnel, a part of the San Joaquin Light & Power Corporation's Kings River project. Work was begun in September, 1925.

Engineer Reports on Oakland's Proposed Water Projects

That the Upper Mokelumne water and power project as proposed by the Citizens' Water Committee of Oakland, Calif., will not furnish water any cheaper than the Lancha Plana project on which the East Bay Municipal Utility District is at present engaged is the opinion of a report prepared for the Oakland Chamber of Commerce by Lester S. Ready, chief engineer, California Railroad Commission.

According to Mr. Ready's report, the Lancha Plana project will require an initial expenditure of \$32,102,000 for the first step to be completed by 1930 and a total capital expenditure of \$65,852,000 by 1966 to provide for the full capacity of 200,000,000 gallons daily. Power production at the Lancha Plana dam from a 7,000-kw. plant will be sufficient to supply all pumping requirements until 1954.

The Upper Mokelumne project would require 300,000 acre-ft. of storage to provide the 200,000,000 gallons daily in place of the 222,000 acre-ft. at the Lancha Plana dam. This project would require an initial capital expenditure of \$32,896,000 and a total capital expenditure of \$110,410,000. Power production on the upper project could not begin before 1946 when 86,000 kw. could be installed in five plants.

In addition, the upper project is in conflict with certain rights acquired by the Pacific Gas and Electric Company from W. S. Preston, Jr. The plans of the power company call for the installation of a 42,000-kw. plant at Tiger Creek on the Mokelumne River and an increase in the capacity of the present Electra plant from 20,000 kw. to 50,000 kw. or more. (Journal of Electricity, Feb. 15, 1926, p. 157.) Present plans call for these installations by 1930. Both of these developments would be beneficial to the Lancha Plana project and neither would be possible if the Upper Mokelumne project was developed.

The report goes into considerable detail as to comparative costs.

Short Course for Metermen Held by Colorado University

The fourth annual short course for metermen recently held at the University of Colorado, Boulder, drew an attendance of thirty-five, of whom twenty-five were connected directly with the electrical industry in Colorado and Nebraska. The course was held under the auspices of the extension division of the University of Colorado and under the direct supervision of Prof. C. M. McCormick, in charge of the standardizing laboratory of the school.

The instruction continued over a period of three days and included addresses on a variety of phases related to the general subject. Speakers were drawn from the electrical industry in the region and from the faculty of the university.

Aside from routine work, those attending heard an illustrated address on the Moffat tunnel by Clifford A. Betts, office engineer, and were piloted through the new Valmont steam generation plant of the Public Service Company of Colorado by H. H. Kerr, electric superintendent of that company. A banquet was tendered on the evening of the second day through

the courtesy of the Sangamo Electric Company and the Westinghouse Electric and Manufacturing Company.

Power Project Planned on Clearwater River, Oregon.—The Inland Power & Light Company, of Portland, Ore., has applied for a license covering a power project on Clearwater River near Lewiston, Ore. It is proposed to build a concrete spillway diversion dam 925 ft. long with a tail-race 4,500 ft. long. One 7,000-hp. turbine is to be installed.

P.C.E.A. Holds Meter Short Course at "Cal. Tech."

First annual short course for metermen to be held in southern California under the auspices of the educational subcommittee of the meter committee, P.C.E.A., was held at California Institute of Technology, Pasadena, this spring. There were thirty-six metermen in attendance at the meetings, representing all of the electric utilities of southern California.

R. W. Sorenson, professor of electrical engineering at "Cal. Tech.," not only supervised the instructional course but took an active part in the lectures and demonstrations. Classes were in session from 8 a.m. until 5 p.m. each of the five days of the session. An excursion to the test departments of the Southern California Edison Company and of the Los Angeles Bureau of Power and Light was made the sixth day. The course included both lectures on the theory of the different meters and laboratory experiments dealing with the practical side of metering.

The course was adjudged a great success. A similar course was conducted later at the University of California, Berkeley.

The territory served by the P.C.E.A. is so large that it worked out much better to have these two courses than to have only one for both sections of the state. Last year, with only one course at Berkeley, the total attendance was forty-nine. This year the Berkeley course attendance was thirty-three and that at Los Angeles thirty-six, making a total for the two of sixty-nine, a 48-per-cent increase in attendance over the previous year.



The men who took the short course for metermen given at the California Institute of Technology under the auspices of the P.C.E.A.

A.I.E.E. News

A.I.E.E. Chooses New President at Annual Election

Cummings C. Chesney, manager and chief engineer, General Electric Company, Pittsfield, Mass., was elected president of the American Institute of Electrical Engineers at the annual business meeting held in the Engineering Societies Building, New York, May 21. Other officers elected were: vice-president—H. M. Hobart, Schenectady, N. Y.; George L. Knight, Brooklyn, N. Y.; B. G. Jamieson, Chicago, Ill.; A. E. Bettis, Kansas City, Mo.; H. H. Schoolfield, Portland, Ore.; managers—F. J. Chesterman, Pittsburgh, Pa.; H. C. Don Carlos, Toronto, Ont.; I. E. Moulthrop, Boston, Mass.; treasurer—George A. Hamilton, Elizabeth, N. J. (re-elected).

These officers, together with the following hold-over officers, will constitute the board of directors for the next administrative year, beginning Aug. 1: M. I. Pupin, New York; Farley Osgood, New York; P. M. Downing, San Francisco, Calif.; Herbert S. Sands, Denver, Colo.; W. E. Mitchell, Birmingham, Ala.; Arthur G. Pierce, Cleveland, Ohio; W. P. Dobson, Toronto, Ont.; W. M. McConahey, Sharon, Pa.; W. K. Vanderpoel, New York; H. P. Charlesworth, New York; John B. Whitehead, Baltimore, Md.; J. M. Bryant, Austin, Tex.; E. B. Merriam, Schenectady, N. Y.; M. M. Fowler, Chicago, Ill.; H. A. Kidder, New York; E. C. Stone, Pittsburgh, Pa.

Vancouver Section Holds Annual Meeting.—At the annual meeting of the Vancouver Section, held at the University Club June 1, the following officers were elected: chairman—R. L. Hall; secretary—C. W. Colvin; executive committee—A. Vilstrup, C. N. Beebe and A. C. R. Yuill.

News Briefs

Great Western Would Study Silver Creek Project.—Offering to make a study of the Silver Creek project for the purpose of making the Sacramento Municipal Utility District an offer for the power to be developed on that river in connection with the district's water project, or an offer for the lease of the water, the Great Western Power Company is preparing to send engineers to study the records of the district and make surveys of the project, according to press dispatches. The action is said to be the outgrowth of a conference between W. G. B. Euler, general superintendent, C. M. Mardel, chief engineer of the company, and R. L. Jones, Ben Leonard and Albert Elkus, directors of the district. The Pacific Gas and Electric Company also has started a survey for the same purpose. The offers made will determine the course of development of the project, it is stated. In case of lease to either company, with the company building its own plant, contract will be required permitting the district to take over the plants at the end of a 23-year period at their cost, it is provided.

First Exhibition of Talking Film Made at N.E.L.A. Convention.—A talking film based on a comprehensive scenario prepared by Ray D. Lillibridge, Incorporated, to show the advantages of Servel electric refrigeration was presented at the recent N.E.L.A. convention. As the observers watched the moving picture they heard at the same time the words of the salesman explaining the various advantages of the refrigerator. The exhibition was the first practical application of phono-films, the invention of Dr. Lee DeForest, and also the pioneer showing of colored animation.

Power Project for West Fork of Miller River, Washington.—Application has been filed with the supervisor of hydraulics of Washington by E. A. Olson and W. T. Batcheller, both of Seattle, for permission to divert 260 sec.-ft. of water from the West Fork of the Miller River at a point a few miles south of Skyomish. The water is to be used in the generation of 10,300 continuous electrical horsepower and the cost of the power plant is estimated at \$1,300,000. The project includes the erection of a 100-ft. dam to impound 45,000 acre-ft. of water, the reservoir to be raised around the present Dorothy Lake.

Denver Applies for Water Rights on South Platte River.—The City and County of Denver have applied to the Federal Power Commission for a preliminary permit covering a project on the South Platte River to provide water for municipal use and to develop power. The development includes six reservoirs with a total capacity of 443,200 acre-ft. It is proposed to build a power house at each reservoir, the total amount of power to be developed to be 59,250 kw.

Company Negotiates for Hydroelectric Plant of Duncan, Vancouver Island.—The International Utilities Corporation of New York is negotiating with the city of Duncan on Vancouver Island for the acquirement of the city's hydroelectric plant, and for a 20-year franchise for the distribution and sale of electric current within the city limits, at the end of the 20-year period the city either to grant an extension to the company or to take over the plant at a valuation. At a recent meeting of the city council it was decided to ask the International company to appoint a representative to confer with the city's electric light committee on details of the company's offer.

Two Wyoming Utilities Sold.—The electric light and power systems at Lovell and Newcastle, Wyo., recently have been purchased by the Midwestern Power Company, Salt Lake City. Lovell is in the northern end of the Big Horn basin and is about thirty-seven miles from Greybull, where the Midwestern Power Company for some time has owned the electric system. Newcastle is the county seat of Weston County and is located about forty-five miles from Edgemont, S. D., where the Midwestern Power Company already has a plant.



Recently completed quarters for the electrical distribution department of the Los Angeles Gas and Electric Corporation. The outside dimensions of the building are 230 x 65 ft. It has been so constructed as to permit of the addition of another story should this become necessary. In the rear of the building four open-sided sheds offer protection for approximately 200 automobiles. A loading platform extends the full length of the building in the rear.

Discovery May Affect Electric Trucks.—The report of the discovery of a new element making possible lighter storage batteries, coming from Vienna, Austria, may have an effect upon future transportation by means of electric trucks, it is pointed out in a recent issue of the Journal of the A.I.E.E. When perfected for commercial uses the new element would provide lighter storage batteries, for the new element is one-fifth the weight of lead and is said to surpass the lead accumulators now used in storage batteries in both capacity and power.

Ojai Irrigation District Applies for Water for Power Development.—Trustees of the proposed Ojai Irrigation District have asked authority to use 30,800 ft. of water per annum from Sespe Creek in Ventura County. The stream is a tributary of the Santa Clara River. With an expenditure of \$2,060,000 the trustees estimate the proposed district would be able to develop 6,818 hp.

Building Program of Westinghouse Company \$5,000,000.—An expenditure of more than five million dollars is involved in the building program planned by the Westinghouse Electric & Manufacturing Company, East Pittsburgh. The structures now under construction include a new general office building at the East Pittsburgh works, a four-story office, warehouse and service station building in Detroit, a cement pole plant in St. Louis for the George Cutter organization of the Westinghouse interests, and a two-story office building in Derry, Pa. Plans have been approved for the construction of a \$500,000 storehouse at Mansfield, Ohio, and for additional buildings at the works at East Springfield, Mass., while plans are being prepared for construction work at Sharon, Pa., that will entail a cost of \$275,000.

Great Northern Railway Applies for Washington Water Rights.—In preparation for the electrification of its western lines the Great Northern Railway, through its vice-president, C. A. Jenks, recently filed application with the office of the state supervisor of hydraulics at Olympia, Wash., to appropriate 80 sec.-ft. of water from Deception Creek, a tributary of the Tye River. The water is to be used in an electrical development project to be located southwest of Scenic in the Cascade Range, whereby the railway hopes to generate 11,400 hp. under a head of 1,350 ft. A concrete dam 800 ft. long will form a reservoir with a capacity of 2,000 acre-ft.

Students Visit Edison Company's Power Project.—Twenty-one seniors in the civil engineering course at the California Institute of Technology, with Prof. Franklin Thomas, Prof. George Forster, Walter Ogier and F. W. Maxstadt, of the departments of civil, mechanical and electrical engineering, recently spent five days as the guests of the Southern California Edison Company at the company's hydroelectric project on the San Joaquin and Big Creek Rivers. During the trip the party visited the Stevenson Creek experimental arch dam which is located within the territory covered by the Edison company's construction activities.

Ogden's Street Lights to Be Increased 49 Per Cent.—A contract has just been closed between the city of Ogden and the Utah Power & Light Company whereby the city of Ogden will receive an increase of 49 per cent in street lights throughout the residential and business sections. With the exception of the large arc lights in the downtown sections all arcs are to give way to the incandescent type of lamp. The new contract covers a three-year period.

Utah Utility Extends Its Lines.—The Utah Power & Light Company is extending its lines to serve the town of Castle Dale, Utah. This town formerly was served by a privately owned small local plant. Hitherto Huntington has been the southern terminal of the Utah Power & Light Company's territory, but this new extension, which also includes several other small towns in the coal fields, will bring the company's lines several miles further south.



News of the Electragists



Many Plan to Attend Meeting of Electragists in San Diego

Reservations for the quarterly meeting of the California Electragists, Southern Division, have been received in large numbers from all parts of southern California, according to C. J. Geisbush, executive secretary. The convention will be held at the Hotel San Diego, San Diego, on Saturday, June 26.

Plans have been made for a very instructive program, which will include reports of the work which has been done by the merchandising committee and the estimating section. Meetings of the convention will be held in the sun room of the Hotel San Diego.

The Ruth Alexander, carrying delegates from the immediate vicinity of Los Angeles, will leave Los Angeles Harbor Friday, June 25 at 7:30 p.m. Dancing and other entertainment will be provided following dinner. The boat will arrive in San Diego Saturday morning about eight o'clock.

A banquet and ball will be held at the Hotel San Diego Saturday night. By special arrangement with the Pacific Steamship Company delegates returning on the Ruth Alexander will not have to leave the hotel until 11:30 p.m. Saturday for the return voyage to Los Angeles.

Inspectors Extended Courtesy Membership by Electragists

Believing that the standards of the National Electrical Code and the Safety Orders of the Industrial Accident Commission of California best can be enforced by complete co-ordination of effort between the Electragists and the municipal electrical inspectors, the California Electragists, Southern Division, have extended a courtesy membership in their organization to municipal electrical inspectors in southern California.

The California Electragists are striving to build up and maintain high standards of quality in workmanship and materials within the electrical industry so that the public may be better served. The electrical inspectors are interested in enforcing the standards which are effective at the present time. It is felt that the closer co-operation which will exist between the two groups through their contact in the organization will be mutually beneficial.

Pasadena Electragists Elect Officers.—New officers of the Pasadena branch of the California Electragists, Southern Division, have been elected for the year as follows: president—J. B. Morgan; vice-president—C. A. Rowley, The McNally Company; secretary—H. W. Barnes, Barnes Brothers; and treasurer—R. H. McCormick, McCormick Electric Shop.

Everett Weant of Cline's Electric Shop, San Luis Obispo, Calif., was a recent visitor in Los Angeles.

Electrical Council, Underwriters' Laboratories Meets in Chicago

The sixth meeting of the Electrical Council of the Underwriters' Laboratories was held at the principal offices and testing station, in Chicago May 25-26. Thirty-five of the forty-five members of the council were present, having come from all parts of the United States and Canada. Western men in attendance at this meeting included Claude W. Mitchell, Board of Fire Underwriters of the Pacific, R. J. Larrabee, Underwriters' Laboratories, both of San Francisco; and Harry



C. W. Jones, treasurer of the Southern Division of the California Electragists. Mr. Jones is proprietor of the Pomona Fixture and Wiring Company of Pomona, Calif.

N. Beecher, chief electrical inspector, Los Angeles.

During the sessions there was discussion of a wide variety of electrical appliances and materials and their relation to fire and accident hazards. A considerable amount of time during the sessions was devoted to a discussion of requirements for non-metallic sheathed cable and to the discussion of proposed changes in requirements for older wiring materials.

The Lynwood Electric Company, F. A. Lampe, proprietor, has moved into a new store at 203 N. Long Beach Boulevard, Lynwood.

Don Conover, formerly with the Myers Electric Company, Los Angeles, has been appointed sales manager of the Woodill-Hulse Electric Company, of that city.

J. R. Wilson, formerly with the Los Angeles Electric Works, has resigned to become connected with the Quality Electric Company of Los Angeles.

Book Reviews

THE AMERICAN YEAR BOOK

A Record of Events and Progress for the Year 1925

Edited by Albert Bushnell Hart and William Schuyler and containing contributions from 270 distinguished editors, educators, university heads, federal authorities, scientific directors, technical experts and business leaders. In eight classifications, with 360 sections, carefully indexed and convenient in size. Published by The MacMillan Company, New York, for the American Year Book Corporation, which represents 45 constituent societies. \$7.50.

Published for the first time since 1919, the reappearance of the American Year Book, for 1925, will be welcomed by all who have used the work previously and by those who become initiated into its broad cultural as well as practical usefulness in the present edition.

The remarkable thing about the book is its complete ramification into all phases of American life and activity, and the fact that its surveys of the year's progress are written by the foremost authorities on the subjects.

From the electrical industry standpoint it contains valuable and searching treatments of questions of public resources and public work, public services and utilities, taxation, economic and business conditions, engineering and construction and other subjects of interest to individuals for their own particular interest.

Every device to make the work one to which easy reference may be made has been incorporated in its indexing, its typographical and content arrangement. Statistics, analyses, and bibliography are selected for their conciseness and grasp.

Aside from its technical, economic, governmental, scientific or social content, there is recorded the advances in the humanities, the arts and letters of America for the year.—W.A.C.

N.E.L.A. Serial Reports.—Two more serial reports of the prime movers committee, Technical National Section, now are available. One of these deals with Specifications, the object being to formulate general specifications for the major items of power-plant equipment. This is designed to be of service to the specification writer. The second of the reports covers Distillation Products of Coal. This is largely a brief review of leading processes for the low-temperature carbonization of coal and allied processes. The utility of these processes as sources of suitable fuels is discussed. The price to members is 15 and 25 cents, respectively.

Heat Transmission Lecture Printed.—A printed lecture containing data on heat transmission through heated walls and formulas for the determination of heat losses through various kinds of walls may be had from the publishers, Celite Products Company, New York. Bulletin No. 131.

Meetings

Pacific Coast Electrical Supply Jobbers Meet at Del Monte

The quarterly meeting of the Pacific Coast Electrical Supply Jobbers' Association took place at Del Monte, Calif., May 12-14. In accordance with the organization's usual custom, closed sessions were held in the mornings of the first three days, presided over by O. B. Stubbs, president. On the evening of Friday, the 14th, an open meeting was held at which Eugene G. McCann, president of the San Francisco Electrical Development League, delivered an interesting and informative address on the function of the league and its value to the electrical industry, followed by an animated discussion of the various matters brought out by Mr. McCann.

The open meeting on Saturday morning, the 15th, was devoted to a report on the progress of the Red Seal movement now being conducted on a state-wide basis in California by the California Electrical Bureau. C. T. Hutchinson, chairman of the advisory committee of the bureau, who delivered the address, gave a general report on the organization plans of the bureau, described in detail the routine involved in the administration of the Red Seal plan, touched upon the financial affairs, and reported thirty-three Red Seal homes as the result of the first month's work, forty-eight for the second, and seventy-one for the third. H. L. Harper, C. E. Listenwaller, W. S. Berry and a number of others participated in the discussion that followed.

The annual golf tournament was held Friday and Saturday in the afternoon, and D. E. Harris, president of the Pacific States Electric Company, distinguished himself by achieving the lowest net score, thereby attaining the honor of having his name inscribed upon the famous Copper Cup.

A number of members from outside the state attended the meeting.

Southern California Refrigerator Distributors Organize

Distributors of six electrical refrigerator manufacturers and a number of power-company representatives met recently in Los Angeles to consider the development of electrical refrigeration in southern California. More than thirty were in attendance.

The meeting was called at the request of J. Robert Crouse who explained the organization of the distributors that has been formed in Cleveland and also the National Refrigeration Manufacturers Council, of which Mr. Crouse was a founder. Mr. Crouse is also vice-president of the Electric Refrigeration Corporation.

After thoroughly explaining the Eastern organization, Mr. Crouse suggested that a similar organization be formed to cover southern California, and it was agreed by those present that there is a need for a similar organization in Los Angeles. An organization committee for the purpose of forming such an organization was ap-

pointed. The committee consists of W. F. Brainerd, California Electrical Bureau, chairman; L. D. Robertson, Kelvinator Company; A. L. Spring, Servel Company; Ivan de Jongh, Frigidaire Company, and representatives of three power companies to be chosen later.

Salt Lake Electrical Men Hold Annual Golf Tournament.—The annual golf tournament for the 1926 season for members of the electrical industry in Salt Lake City is now under way. This tournament, which is under the auspices of the Rocky Mountain Electrical Co-operative League of Salt Lake City, is being conducted in four legs, one each in May, June, July and August. The winners of the four monthly tournaments will compete during early September for the championship of the electrical industry. Suitable prizes will be awarded to the winner of each monthly tournament and for the winner of the tournament. An entrance fee of \$1 is charged, and the money so collected will be used in the purchase of prizes for the tournament. A large number of participants are entered.

COMING EVENTS

California Electragists, Southern Division—

Quarterly Convention

Hotel San Diego, San Diego, Calif.

June 26, 1926

Northwest Electric Light and Power Association—

Annual Convention—Spokane, Wash.

June 14-17, 1926

American Society of Agricultural Engineers—

Annual Convention—Tahoe Tavern.

Lake Tahoe, Calif.

June 23-26, 1926

American Institute of Electrical Engineers—

Convention—White Sulphur Springs, W. Va.

June 21-25, 1926

Association of Electragists, International—

Annual Convention—Cedar Point-on-Lake-Erie, Sandusky, Ohio

Headquarters—The Breakers

Aug. 24-27, 1926

American Institute Electrical Engineers—

Pacific Coast Convention, Salt Lake City, Utah

Sept. 7-10, 1926

California Electragists—

Annual State-wide Meeting—Hotel Del Monte

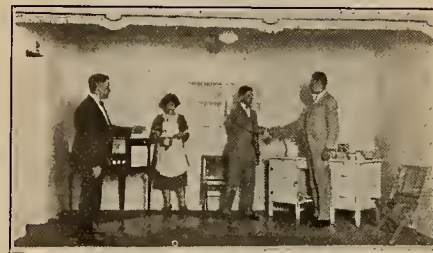
Del Monte, Calif.

Oct. 1-3, 1926

Washington Water Power Company Men Golf Winners.—B. C. Childs of the commercial department of The Washington Water Power Company was winner of a blind hole tournament held by employees of that company at the Hayden Lake golf course on May 1 in which eighteen central station men and jobbers took part. In a special event of 54 holes, played on three courses around Spokane, J. E. E. Royer and R. B. McElroy of The Washington Water Power Company defeated R. O. Bremmer of the Pacific States Electric Company and J. P. Carson of the Graybar Electric Company 12 up. The final 18 holes was played at the W.W.P. tournament.

Red Seal Play Big Success at San Diego Electric Club

An unusually successful presentation of the Red Seal Plan was given before a large gathering of architects, electrical and building contractors when the San Diego Electric Club recently presented "Standards," a one-act comedy drama written and directed by G. H. P. Dellmann, lighting sales engineer of the San Diego Consolidated Gas and Electric Company. Preceding the play a luncheon was served. Each member of the club brought one or more architects as guests, the total attendance being approximately two hundred. As announced on the pro-



Scene from the playlet "Standards," as presented by the San Diego Electric Club. Left to right—A. Reynolds, as Hadley, the Architect; Ruth Creveling as Mrs. Hadley; K. Lyons as Bill Brown, Electragist; and P. Adams, as Mr. Hathaway of the California Electrical Bureau.

gram, the playlet was "dedicated to all architects, builders, electrical contractors and home-owners," and was received enthusiastically.

"Standards" was written with the sole object in view of presenting the Red Seal Plan in a concise and interesting manner; its success has convinced the San Diego Electric Club that a playlet of this character makes a more distinct impression than a speech embodying the same subject matter.

The stage was set as a modern kitchenette, including electric range, convenience outlets, kitchen daylight unit, and similar equipment, thus making a particularly appropriate setting for the story of adequate house-wiring. The play centers around the defection of John Hadley, architect, because of trials incident to lack of standardization. Later on his brother-in-law, an electrical contractor, tells of his struggles along the same line, showing the unprofitable and unnecessarily destructive competition between electrical men. At just the right time Mr. Hathaway of the California Electrical Bureau comes to call and convinces both the architect and the electrical contractor that the Red Seal Plan is the only logical solution of their problem. Most of the comedy lines are introduced by Jane Hadley, wife of the architect.

The cast of the play as given in San Diego was as follows: Jane Hadley, wife of John Hadley, played by Ruth E. Creveling; John Hadley, architect, Alexander Reynolds, Jr.; Bill Brown, brother of Jane, Kenneth Lyons; Mr. Hathaway of the California Electrical Bureau, Percy Adams.

At the conclusion of the play W. F. Brainerd, of the California Electrical Bureau, addressed the club and its guests on "What the Red Seal Means."

The play was repeated early in June before the San Diego Realty Board.

Personals

J. P. Jollyman, chief, division of hydroelectric and transmission engineering, engineering department, Pacific Gas and Electric Company, San Francisco, recently returned from Princeton University where he delivered a lecture under the Cyrus Fogg Brackett



J. P. JOLLYMAN

Lectureship. Mr. Jollyman, who spoke on "Electric Transmission of Power," was the second lecturer from the Pacific Coast under that lectureship, the first having been the late John A. Britton, who delivered a lecture on "Public Utility Development on the Pacific Coast" in April, 1922. Since 1920 Mr. Jollyman has had charge of the design of the hydraulic and electrical installations of the hydroelectric plants, the electrical features of the high-tension transmission lines, and of the connected substations of the Pacific Gas and Electric Company. Some of the more important projects recently undertaken have been Pit River Power House No. 3, 81,000-kva. capacity, operating at 220 kv.; the 30-mile extension of the 220-kv. line from Vaca-Dixon substation to Contra Costa substation near Antioch, this line containing the first long-span construction for 220 kv., the extension of Vaca-Dixon substation to 150,000-kva. capacity; and the construction of Shasta, Contra Costa, 50th Avenue, Oakland, and Martin substations. A graduate of Stanford University with the class of 1903, Mr. Jollyman entered the employ of the California Gas & Electric Corporation, predecessor of the Pacific Gas and Electric Company, and remained until 1909 when he joined the Great Western Power Company's organization. Mr. Jollyman was in charge of that company's Big Bend power house and the changing over of the transmission line from 60,000 to 100,000 volts. In 1911 he returned to the Pacific Gas and Electric Company as engineer of electrical construction.

S. B. Gregory, Western manager, Arrow Electric Company, with headquarters in San Francisco, is making a trip to Hartford, Conn., to attend the company's annual sales conference held at the factory. He is accompanied by Carl G. Sachs, Los Angeles representative.

G. G. Thompson, formerly with the Ward-Leonard Electric Company, New York, now is vice-president of the Safety Electric Products Company, Inc., Los Angeles. Mr. Thompson is in charge of the latter company's newly opened office in San Francisco.

Frank M. Harris, chief of the bureau of specifications and estimates, engineering department, Pacific Gas and Electric Company, San Francisco, received the Harriet Billings prize which was awarded at the N.E.L.A. convention. The prize, a cash award of \$50, was donated by Arthur Williams, vice-president, The New York Edison Company, in recognition of Miss Billings' services to the National Electric Light Association as secretary in its early days, for the second best paper on any subject relating to the electric light and power industry.

W. F. Brainerd, of the California Electrical Bureau in Los Angeles, has been made chairman of a committee appointed at a recent meeting of electrical refrigerator distributors and power-company representatives in that city to form an organization of electrical refrigerator distributors in southern California. **L. D. Robertson**, Kelvinator Company; **A. L. Spring**, Servel Company, and **Ivan de Jongh**, Frigidaire Company, are other members of the committee.

Guy W. Talbot, president, **L. A. McArthur**, vice-president and general manager, and **Mrs. McArthur**, and **M. J. Wilkinson**, assistant secretary and assistant treasurer, Pacific Power & Light Company; **S. E. Skelley**, manager investment department, Pacific Power & Light Company and Northwestern Electric Company; **L. T. Merwin**, vice-president and general manager, Northwestern Electric Company; and **W. P. Strandborg**, director of publicity, Portland Electric Power Company, represented the Portland power companies at the N.E.L.A. convention.

Virgil E. Stone, of the budget department of the Public Service Company of Colorado, and a lieutenant in the Colorado air squadron, recently flew from Denver to Little Rock, Ark., to attend the air meet and elimination races held at that place.

H. H. Schoolfield, chief engineer, Pacific Power & Light Company, Portland, Ore., has been elected a vice-president of the American Institute of Electrical Engineers. **P. M. Downing**, vice-president in charge of electrical construction and operation, Pacific Gas and Electric Company, San Francisco, holds over as a member of the board of directors for the ensuing year.

William C. King, for four years in the power sales department of the Los Angeles Bureau of Power and Light, has joined the staff of the Thomas Machinery Company in that city.

Richard E. Smith, publicity manager, Southern California Edison Company, was guest speaker at a recent luncheon of the Electric Club of San Diego. Mr. Smith was a delegate to the eleventh annual conference, second district Rotary, in that city.

George A. Kieffer, formerly with the American Purchase & Sales Corporation, San Francisco, and prior to that time salesman for the Manning-Bowman Company, has established himself as manufacturers' agent in that city representing the Roach Appleton Manufacturing Company of Chicago.

Morris L. Foster, commercial agent, and **William Evans**, salesman, Santa Cruz, Calif.; **O. A. Brugler**, agent, and **C. G. Glascoe**, salesman, Watsonville; **E. D. Murray**, agent, and **Charles O. Phillips**, salesman, Hollister; **R. G. Barnett**, agent, and **G. B. Andrews**, salesman, Gilroy, all members of the Coast Counties Gas & Electric Company's organization, attended a two-day conference on electric refrigeration and air and water heating held recently in San Francisco.

Walter G. Blossom, field superintendent of education for the Southern California Edison Company, recently addressed a meeting of the Junior Chamber of Commerce of San Diego on the subject of "The Romance of Electricity." His talk was illustrated by means of moving pictures of various hydroelectric projects.

L. A. Barley, chief engineer, Mountain States Inspection Bureau, addressed the contractors and municipal light department employees of Colorado Springs, Colo., at their first get-together meeting there. **Matt Whitney**, prominent Colorado Springs electrician, arranged the meeting and served as chairman.

Robert S. Prussia, district illuminating engineer and salesman for the Westinghouse Lamp Company, San Francisco division, was elected president of the Oakland Electric Club at its annual meeting recently. A native of California, Mr. Prussia received his education in Sonoma County and except for a few years as representative for a typewriter concern, has lived and worked in California. He entered the lamp-making industry in 1915 with the National Lamp Works but soon became associated with the Westinghouse Lamp Company, with which he has been connected ever since. Always deeply interested in illuminating engineering, he was active in the found-



ROBERT S. PRUSSIA

ing of the Bay Cities Chapter of the Illuminating Engineering Society and was one of its first directors. Mr. Prussia was one of a committee of five men who were asked to draw up the industrial lighting code for the State of California. He was chairman of the lighting committee, Commercial Section of the Pacific Coast Electrical Association, in 1923, and has been a member of the committee since. Mr. Prussia now is planning the illumination for the Nevada Transcontinental Highway Exposition to be held at Reno, Nev., in 1927.

Otto Reiman and L. E. Clark, of the Reiman Wholesale Electric Company, Los Angeles, have purchased the stock in that company formerly held by J. S. Marks, formerly treasurer of the company, who is retiring to attend to private interests. M. P. Shupe has been added to the firm's sales force.

J. R. Broughton, for several years store salesman for the Graham-Reynolds Electric Company, Los Angeles, has joined the sales force of Garnett Young & Company in that city.

William Morrell has been appointed Los Angeles representative of the George A. Gray Company, Pacific Coast manufacturers' agent.

Harry Fife, formerly a member of the Reiman Wholesale Electric Company's organization, Los Angeles, has become affiliated with the sales force of the Illinois Electric Company of that city.

A. M. Frost, sales manager, San Joaquin Light & Power Corporation, Fresno, Calif., has been awarded third prize as geographic chairman, Pacific Coast Division, National Industrial Lighting Activity. The campaign was conducted under the auspices of the Industrial Lighting Committee of the National Electric Light Association from Sept. 1, 1925, to March 1, 1926, and Mr. Frost won his prize for making one of the best and most complete reports of what had been accomplished during that period in the territorial division of which he was chairman. Mr. Frost has been connected with the San Joaquin Light & Power Corporation for about fifteen years, having entered its employ in 1911 as manager of the Paso Robles district. From there he was transferred to Santa Maria as manager, remaining until 1914, when he was made manager at Selma. Six years later he went into business for himself selling and installing electric pumping plants,



A. M. FROST

giving it up a year or so after to become manager of the San Joaquin company's Fresno district. In 1922 he was appointed to a newly created position of sales manager in charge of the company's selling program as regards new business. Mr. Frost is well known in Pacific Coast electrical circles and has taken an active part in affairs of the industry. Among other activities he has served as chairman of the Commercial Section, P.C.E.A., and at the present time he is a member of the executive committee of that section.

William E. Barrett, head of the publicity department of the Westinghouse company in the Mountain region, has been transferred from Denver to the St. Louis office of the company. Melvin E. Lanning, merchandise specialist on the Denver staff, is on special duty in the Salt Lake office of the Westinghouse company and his place has been taken temporarily by E. D. Regan, recently transferred back to Denver from Mansfield, Ohio. J. E. Perdue is the new district manager of the Westinghouse Lamp Company in Denver, recently having been transferred there from Kansas City, Mo., as successor to L. J. Bridger who now is engaged on valuation work for the city in connection with the central station franchise in Denver.

Sam Hall, of the Electric Supplies Distributing Company, San Diego, Calif., paid a visit to Los Angeles a short while ago.

Richard Hall, manager, Illinois Electric Company, Los Angeles, returned a short while ago from a short business trip East.

Frank Yerkes, Carl Luscombe, A. L. Hagerman, Edwin Wagner, G. C. Chipman, W. C. Sterne, Tom Gray, Frank R. Jamison, E. L. Siekman, F. G. Barnett, C. H. Kelliher, E. K. Hartzell, C. J. Hancock, F. S. Henderson, A. A. Newton, J. G. Keegan and L. W. Cody were among those who attended the recent meeting of the district managers of the Public Service Company of Colorado. Officials of the company in attendance were Guy W. Faller, vice-president; C. N. Stannard, vice-president and general manager; H. T. Hughes, treasurer; V. L. Board, general superintendent, and J. E. Loiseau, secretary.

H. E. Sanderson, Pacific Coast manager, Bryant Electric Company, has returned to San Francisco from Bridgeport, Conn., where he attended a sales conference at the factory.

D. E. Harris, president, Pacific States Electric Company, San Francisco, had the low net score in the golf tournament at Del Monte, Calif., during the session of the Pacific Coast Electrical Supply Jobbers Association. This entitles him to have his name engraved on the famous Copper Cup.

V. Howard Wattles has been appointed distributor in northern California for the Universal Cooler Company, Detroit, Mich. Mr. Wattles is returning to the Pacific Coast after an absence of twenty-four years.

Grover Anderson, manager, J. G. Pomeroy Company, San Francisco, made a trip to Sacramento lately.

O. B. Stubbs, president, Stubbs Electric Company, Portland, Ore., attended the recent meeting of the Pacific Coast Electrical Supply Jobbers Association at Del Monte, Calif.

Al C. Joy, manager publicity department, San Joaquin Light & Power Corporation, Fresno, Calif., was the principal speaker at a recent meeting of The Electric Club of Los Angeles. Mr. Joy's subject was, "From Prometheus to the Central Station."

C. R. Gill has been made manager of the Pacific Gas and Electric Company's Colusa (Calif.) district; J. V. Kyle has become manager of the company's Placer County district; and L. J. Nevraumont has been appointed assistant manager of the company's San Joaquin division.

Lafayette Hanchett, president of the Utah Power & Light Company, Salt Lake City, has been re-elected as a director of the Chamber of Commerce of the United States. The district which Mr. Hanchett will represent includes Arizona, Colorado, Idaho, Nevada, New Mexico, Montana, Wyoming and Utah. Mr. Hanchett already has served two years on the directorate to which he has been re-elected. He has been active for many years in the business and industrial life of both Salt Lake and Utah. Besides being president of the Utah Power & Light



LAFAYETTE HANCHETT

Company he is also president of the Inter-Mountain Electric Company of Salt Lake City, vice-president of the National Copper Bank of that city, and president of the Dixie Power Company of southern Utah. He is also a member of the board of governors of the Salt Lake City Chamber of Commerce. Mr. Hanchett is the only director of the United States Chamber of Commerce chosen from the Inter-mountain country. In fact, he, with one other director from Oregon and two from California, are the sole representatives of the states west of the Missouri River.

H. R. Peckham, assistant general superintendent, San Diego Consolidated Gas & Electric Company, made a brief trip to Los Angeles a little while ago.

Obituary

Charles Anderson, owner of the Fremont Electric Company and the Seattle Marine Equipment Company, recently died in Seattle.

John Fallon, electrical contractor of Santa Barbara, Calif., died May 7 as the result of an automobile accident.

Horace H. Miller, secretary, Pacific Lighting Corporation, San Francisco, died in Oakland, Calif., May 28, following an operation.

Jacob Bunn, president, Sangamo Electric Company, Springfield, Ill., died May 10 after an illness of many months. He had been identified with the electrical industry for about thirty years and had been president of the Sangamo Electric Company continuously since its organization in 1899.

TRADE NOTES

Westinghouse Electric & Manufacturing Company, East Pittsburgh, recently has developed three new percolators, a new electric hot plate and a table stove. In two of the new percolator sets a 9-cup-pot type and a 9-cup-urn type, with creamers, sugars and trays to match, are a radical departure from the former design. They will be known as the Empire design and will be finished with a new process which gives them a platinum silver appearance that is softer in tone than the highly polished finish.

Thomas Machinery Company, Los Angeles, has added to its staff William C. King, for four years with the power sales department of the Los Angeles Bureau of Power and Light. Mr. King will handle the sales of the equipment manufactured by The Electric Controller & Manufacturing Company, Cleveland, of the synchronous motors of the Electric Machinery Manufacturing Company, Minneapolis, and the transformers made by the Ahlman Electric Company, Bay City, Mich.

Sangamo Electric Company, Springfield, Ill., has issued bulletin No. 71 containing instructions for Sangamo D-5 watt-hour meters. Photographs and diagrams as well as a table of train ratios and disk constants for two-wire D-5 meters are included in the bulletin.

Fairbanks, Morse & Company have issued bulletin H-338, which is "An Electric Machinery Catechism." It is a 36-page bulletin giving in question-and-answer form a complete resume of the most important theoretical and practical features of the common types of direct current and alternating current motors, generators and control equipment. The pamphlet is intended for the reader unfamiliar with the technical features of electricity. It is profusely illustrated with various types of machines and electrical drawings discussed and covers the field completely.

C. F. Braun & Company have opened sales and engineering offices at Dallas, Texas, in the Republic National Bank Building, with V. V. Jacomini as manager. The office is prepared to make engineering surveys and submit quotations on the Braun products.

Allen Bradley Company, Milwaukee, Wis., has issued bulletin No. 710 covering its new line of type J-1552 across-the-line starting switches, equipped with inducto-therm relays.

Perkins Electric Equipment Company, San Francisco, is representing the Cook Porcelain Insulator Corporation of Cambridge, Ohio, in that city.

Simplex Electric Heating Company, Cambridge, Mass., has issued a 15-page catalog, featuring its complete new line of Simplex electric ranges and the new automatic unit. Photographs of the range with descriptions are given, as well as illustrations and features of the automatic unit governing the temperature control of the range.

General Electric Company, Schenectady, N. Y., has developed several new types of supports and arrangements in switchboard accessories, among them the latest types in busbar supports and a new arrangement of support for group-mounted rheostats, using pipe and standard pipe fittings.

Brown & Pengilly, Inc., San Francisco and Los Angeles, have issued catalog No. 3 for 1926 on switchboards and panel boards, safe-line service switches, motor-starting switches, ebony asbestos wood, testing equipment, steel cabinets, as well as fire-alarm systems. The catalog is illustrated with photographs and diagrams and contains complete price lists.



Conceded by archeologists as the origin of the Charleston is this picture dug up out of Lake Merced golf course. It pictures one Burrell S. Manuel, sales manager of Fobes Supply Company, in a striking pose, very striking. After seeing this picture promoters tried to arrange a match with Andy Gump. "It should be interesting provided they could start and finish the same day," said a big promoter. Andy is yet to be heard from.

The Electric Corporation, Seattle, has taken additional space at 321 Occidental Avenue to care for its increasing business.

The Mine & Smelter Supply Company, Denver, has taken on the Riddle line of lighting fittings.

The Hart & Hegeman Manufacturing Company, Hartford, Conn., has issued literature descriptive of its new style H&H, No. 8601, tumbler switch.

Ingersoll-Rand Company, New York City, has issued a new publication on "Direct-Injection Oil Engines for All Purposes." Illustrations and descriptions are given, portraying the Ingersoll-Rand oil engines as applied to electric railways, marine, power-house, industrial and building applications.

A. J. Lindemann & Hoverson Company, Milwaukee, has developed a new type of toaster, known as the Two-O-Four. This new toaster, which is made of high-grade steel with a heavy, highly polished nickel finish, takes extra large slices of bread, having a toasting surface of $4\frac{3}{4} \times 5\frac{3}{4}$ in. It reverses toast every time the door is dropped. It has a steel braced unit and is provided with a damper-on-the-door, which prevents drafts from interfering with even toasting.

The Electric Refrigeration Corporation, Detroit, Kelvinator division, has brought out a new line of eight cabinet Kelvinator models. They are claimed to represent the latest development both in the art of household electric refrigeration and of fine cabinet-making. The interior finish is glossy white enamel on galvanized iron. All wood cabinet models are moderately priced, have cork insulation and a food storage capacity of $5\frac{1}{2}$ cu.ft. Some have interiors finished in white porcelain on Armco iron. A small de luxe model has both the interior and exterior finished in white porcelain, trimmed with metal corners and edging.

Delta-Star Electric Company, Chicago, has opened a new and larger office at 140 Cedar Street, New York City, in charge of W. S. Nichols, assisted by P. H. Butler and A. R. Beger.

Power Specialty Company, New York City, which handles Foster superheaters, economizers and air heaters, has taken over the Aero Pulverizer Company and with the acquisition of this company is now in a position to build in its own shops and contract for complete steam generating units, including all heating surfaces excepting boiler proper, and to make over-all guarantees including the boiler.

The Austin-Henderson Company has branched out into enlarged quarters at Spokane and is now at home at S. 118 Lincoln Street. The firm will carry an enlarged stock of electrical machinery and has arranged and designed its new office and warehouse better to serve an increasing trade. The business is conducted by Lee F. Austin and Dwight F. Henderson.

The Electro-Kold Corporation of Spokane is making plans to put on a night shift to increase its production, according to L. J. Kimmel, vice-president, this move having been made necessary by an increase in sales of 50 per cent over the factory's normal output.

Ohio Brass Company, Mansfield, Ohio, has moved its Chicago offices from 1217 to 1714 Fisher Building, 343 South Dearborn Street.

The Garl Signal Company, Akron, Ohio, has been formed with a capital of \$100,000. This company has taken over the good-will, basic patents, etc., of the Garl Electric Company and will market the Garl fire and police alarm signals for municipalities and industrial plants.

Bakelite Corporation, New York City, has issued a large folder, illustrated with interesting drawings, giving the story of Bakelite. A complete history of the product back to its earliest discovery is given and its various present-day uses are explained. In addition to this, illustrations of Bakelite in some of its various forms are given.

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